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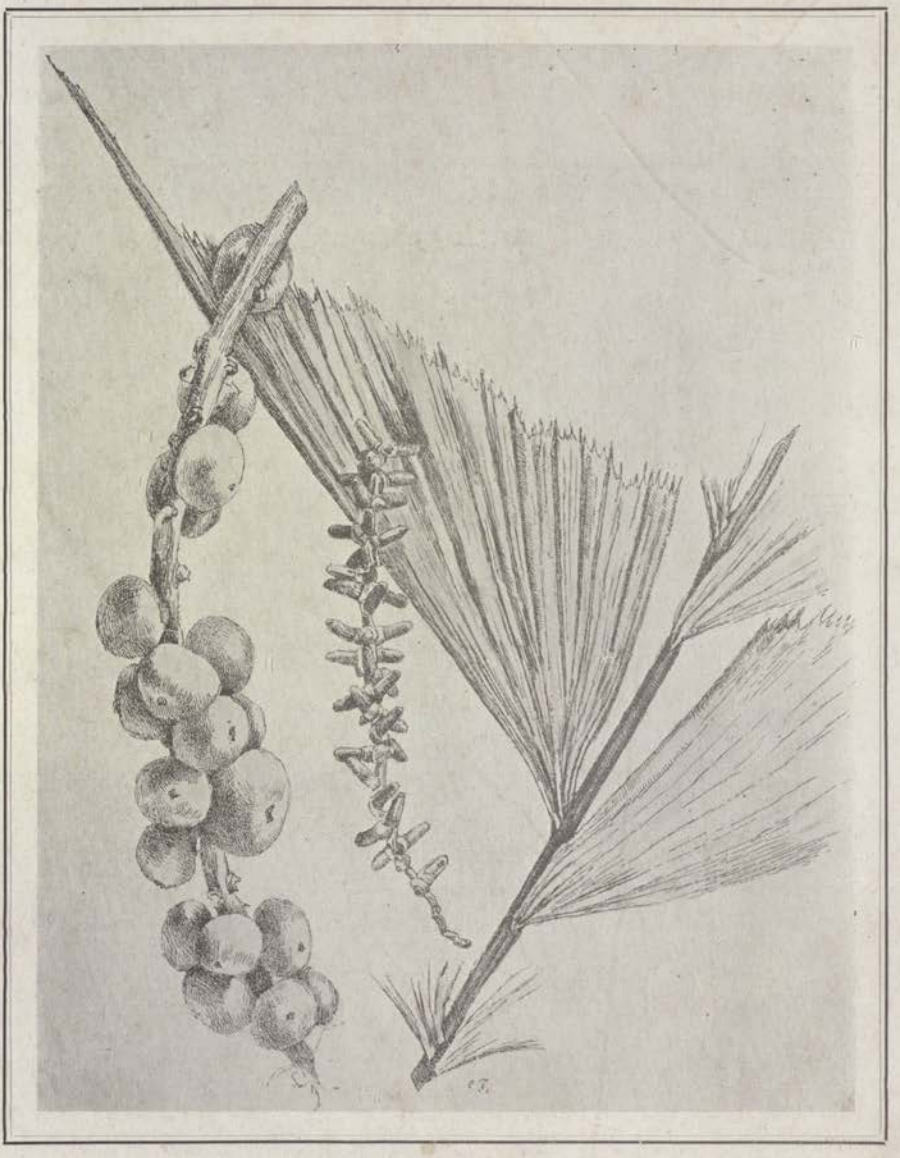

Caryota urens, Linn. (page 559)

FOREST FLORA

OF

THE BOMBAY PRESIDENCY AND SIND.

BY

W. A. TALBOT, F.L.S.,

CONSERVATOR OF FORESTS.

54766

VOL. II.

RHIZOPHORACEÆ TO GRAMINEÆ.

ILLUSTRATED.

POONA:

PRINTED BY GOVERNMENT AT THE PHOTOZINCOGRAPHIC DEPARTMENT.

1911

Indian price ... Rs 4, 5.
English price ... 45½ shillings

00054766

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	,,	v	,,	26	,,	bushes in brackets.		
	,,	36	,,	15	,,	diamter	read	diameter.
	,,	86	,,	23	,,	sheating	,,	sheathing.
	,,	121	,,	12	,,	tiliaceous	,,	tiliaceus.
	,,	129	,,	14	,,	*Gonik chentz*	,,	*Gorakh chinch.*
	,,	141	,,	1	,,	now here	,,	nowhere.
	,,	163	,,	9	,,	pappilose	,,	papillose.
	,,	168	,,	21	,,	Ipomeæ	,,	Ipomæa.
	,,	208	,,	3, 6	,,	Ailantus	,,	Ailanthus.
	,,	347	,,	16	,,	mysurenis	,,	mysorensis.
	,,	376	,,	14	,,	somwhat	,,	somewhat.
	,,	409	,,	19	,,	*Phulas*	,,	*Palas.*
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	,,	455	,,	10	,,	*gœnsis*	,,	*goensis.*
	,,	480	,,	14	,,	upper	,,	lower.
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	,,	108	,,	10	,,	ressembles	,,	resembles.
	,,	132	,,	12	,,	of	,,	for.
	,,	203	,,	31	,,	indigeous	,,	indigenous.
	,,	212	,,	22	,,	830	,,	130.
	,,	216	,,	38	,,	o	,,	5.
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	,,	222	,,	10	,,	Dalz. Gibs.	,,	Dalz. & Gibs.

,, 253—Distribution of T. fasciculata, Western peninsula, Konkan, Southern Mahracta Country, Belgaum, common on the Baba-buden Hills of Mysore in monsoon-forest.

,, 253—Distribution of T. Dalzellii, Western peninsula, Malabar, Konkan ghâts, Mahableshwar. A rare species probably endemic.

,, 253—Distribution of T. asthmatica. Tropical India, Ceylon, Western peninsula; common throughout the Konkan and Deccan districts, mostly in hedges. The roots are sometimes used as a substutute for *Ipecacuanha.*

,,	259	Line	4	For	magin	read	margin.	
,,	336	,,	14	,,	6	read	7.	
,,	,,	,,	17	,,	7	,,	8.	
,,	,,	,,	21	,,	7	,,	9.	
,,	,,	,,	24	,,	8	,,	10.	
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	„	170	„	105	„	Do.	„	do.	do. *Fruit.*
	„	207	„	126	„	Ailantus	„	Ailanthus.	
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FOREST FLORA

OF THE

BOMBAY PRESIDENCY AND SIND.

VOL. II.

Order XL.—RHIZOPHORACEÆ.

Trees or shrubs. Leaves entire, opposite, coriaceous; petioles leaving prominent scars on the branchlets; stipules very caducous. Flowers axillary, regular, bisexual. Calyx more or less adherent to the ovary, persistent, 4-14-toothed. Petals as many as calyx-lobes, entire, emarginate or lacerate. Stamens twice the number of petals, in pairs, opposite to and embraced by them or rarely indefinite. Ovary 2-5-celled; ovules geminate, pendulous; style usually simple; stigma simple or lobed. Fruit coriaceous, 1-celled, 1-seeded. Seed pendulous, arillate or not; albumen fleshy or O; embryo small if albuminous, elongated if exalbuminous; radicle macropodous in the *Rhizophoreæ*, perforating the apex of the pericarp and germinating on the tree.

The two species of *Rhizophora, Bruguiera gymnorhiza, Kandelia* and *Ceriops* constitute the bulk of the well known, evergreen "Mangrove" forests. The trees of this very remarkable woodland formation are provided with contrivances and adaptations to enable them to live in the soft, salt-impregnated mud of tropical shores below high water. This physiologically dry habitat is similar in some respects to that in sandy and lateritic soils, peat bogs and desert regions with a scanty rainfall. The "Mangrove" formation is only found along the muddy foreshores, creeks and backwaters in regions with a heavy rainfall or in regions with a scanty rainfall under favourable circumstances, where the admixture of fresh water compensates for the want of rain, as at the mouth of the Indus river in Sind. The first peculiar and characteristic contrivance which strikes the eye in a "mangrove" swamp is the system of stilt-roots supporting and anchoring the stems in the soft mud which is continually and sometimes, during storms, strongly agitated by tidal movements. The next and perhaps more remarkable character is the arrangement for supplying the underground system with oxygen, consisting of root-knees and thick, asparagus-like short, negatively geotropic root

branches, exserted more or less vertically from the mud. Similar organs are known to exist also in some fresh water plants, palms etc. and are called pneumatophores. Mangrove trees are furnished with contrivances for storing and preventing the transpiration of water similar to those found in other xerophites. Most of the species possess small leathery leaves with a very thick cuticle and are well provided with tracheides and other water-storing tissue.

Ovary inferior. Seed exalbuminous, germinating on tree with a long, exserted radicle. *(Rhizophoreæ).*
- Petals 4. Stamens 8. Ovary 2-celled .... 1. Rhizophora.
- Petals 5-6. Stamens 10-12. Ovary 3-celled .... 2. Ceriops.
- Petals 5-6. Stamens indefinite. Ovary 1-celled 3. Kandelia.
- Petals 8-14, bifid. Stamens 16-28. Ovary 2-4-celled 4. Bruguiera.

Ovary ½-inferior. Seed albuminous, not germinating on tree. (*Legnotideæ*) .... 5. Carallia.

1. RHIZOPHORA, LINN.

Evergreen glabrous shrubs or trees. Leaves opposite, leathery, ovate, mucronate. Flowers rather large, in dichotomous cymes, Calyx 4-lobed, subtended by the united bractlets. Corolla of 4 entire petals, inserted at the base of a fleshy disk. Stamens 8-12; filaments short; anthers multilocellate. Ovary ½-inferior, 2-celled, produced in a fleshy cone beyond the calyx; ovules 2 in each cell; style conical at the base, subulate; stigma bifid. Fruit leathery, conical, indehiscent, 1-celled, 1-seeded; the seed germinating on the tree; radicle elongated, cylindrical, clavate, perforating the apex of the fruit; albumen O.

Peduncles longer than the petioles. Flowers pedicellate ... ... 1. R. mucronata.
Peduncles shorter than the petioles. Flowers sessile ... ... 2 R. conjugata.

1. R. mucronata, Lam. Dict. IV, 199; Fl. Br. I. 2, 436; Bedd. Fl. Sylv. Anal. Gen. t. XIII. fig. 4; Dalz. & Gibs. Bomb. Fl. 95; Brandis For. Fl. 217; Cooke Fl. Pres. Bomb. 1, 472; Gamble Ind. Timb. 333. *Kamo, kunro,* Sind. *Kandal,* M.

A small or moderate-sized evergreen tree, supported on numerous stilt-roots from the stem and branches; branchlets thick, marked with the scars of fallen leaves and stipules, quite glabrous, purple. Leaves elliptic, acute at both ends, usually with a hard mucro at the apex, 3″-8″ by 1·75″-4″, thick, glabrous, bright-

green above, pale beneath, dotted with minute, dark-coloured spots; petioles ·75″-1·5″ long; stipules 2″ long, glabrous, soon caducous. Flowers moderate-sized, pedicelled, in axillary, usually 3-flowered cymes longer than the petioles; pedicels short, thick, rugulose. Calyx ·5″-·6″ long; lobes pale-yellow, oblong-lanceolate, thick, glabrous, keeled within, reflexed in fruit. Petals white, nearly as long as the sepals, oblong, obtuse, thick, fleshy, induplicate, curved, hairy within. Stamens 8; anthers linear, acute. Fruit 1·5″-2″ long, ovate-conical, pendulous, rough, dark-brown; radicle attaining a length of 18″-24″ before falling from the tree.

Fig 289. Rhizophora mucronata, Lamk.

Tidal shores and creeks from the Indus to Malacca, Burmah, the Andamans and Ceylon. On the muddy, tidal flats of the Western peninsular coast, also in Sind, near the mouths of the Indus. Fl. R. S. Fr. Aug.-Sept.

Bark brown, smooth with vertical clefts. Sapwood light-red; heartwood dark-red, with a silver-grain on a radial section, very hard and durable. Pores small, numerous, each in a ring of white tissue. Medullary rays fine, close, wavy. Weighs about 70 lbs. to the cub. ft. Splits and warps in seasoning. Bark used for tanning. The seeds often germinate on the parent tree and drop into the mud as young plants.

2. R. conjugata, Linn.; DC. Prodr. III, 33; Fl. Br. I. 2, 436; Brandis For. Fl. 218; Cooke Fl. Pres. Bomb. 1, 472; Gamble Ind. Timb. 332; *R. Candelaria,* DC. Prodr. 3, 32; Trimen Fl. Ceyl. 2, 151.

A glabrous shrub or small tree similar in habit to *R. mucronata.* Leaves elliptic-lanceolate, acute at base and apex, with a very short mucro, 4″-6″ by 1·75″-2·5″, dark-green above, paler and sparsely dotted beneath; petioles ·5″-1″ long; stipules 2″-3″ long. Flowers sessile, about ·25″ long, in axillary, 2-flowered cymes, usually shorter than the petioles, pedicels 0. Calyx-lobes ovate, acute, ·5″-·75″ long, rugose and striate on the outside. Petals white, slightly shorter than the calyx, linear, flat, glabrous, early caducous. Stamens 11-12. Fruit about 1″ long with reflexed calyx-lobes, similar to that of *R. mucronata.*

Tidal shores from the Indus to Ceylon. Along the Western peninsular coast. Fl. R. S. Fr. Oct.-Nov. Fruit as in *R. mucronata,* but the radicle is smaller.

2. CERIOPS, Arn.

Evergreen trees or shrubs with stilt-roots and pneumatophores. Leaves opposite, simple, coriaceous; stipules interpetiolar, caducous. Flowers subcapitate, on axillary peduncles. Calyx 5-6-divided, surrounded by the connate bracteoles. Petals 5-6, inserted at the base of the 10-12-lobed disk; lobes of the petals with clavate bristles. Stamens 10-12, in pairs, opposite the petals. Ovary ½-inferior, 3-celled; cells 2-ovuled. Fruit 1-celled, 1-seeded; radicle as in *Rhizophora.*

C. Candolleana, Arn. in Ann. Nat. Hist. 1, 363; Fl. Br. I. 2, 436; Bedd. Fl. Sylv. 99; Brandis For. Fl. 218; Cooke Fl. Pres. Bomb. 1, 473; Gamble Ind. Timb. 333. *Kirrari, churi,* Sind.

A glabrous evergreen shrub or small tree; branchlets marked with the scars of fallen leaves and stipules. Leaves obovate-oblong, 2″-4″ by 1·25″-2″, coriaceous, glabrous, dark-green above, yellowish-green beneath, rounded at the apex,

and sometimes slightly emarginate, narrowed into the petiole at the base; petioles ·3″-1″ long, rugose; stipules 1·5″-2″ long, soon caducous. Flowers in axillary, peduncled, branched umbels; peduncles stout, deflexed, glabrous, ·25″-·5″ long; pedicels 0. Calyx ·25″ long; lobes 5-6, oblong, subacute. Petals shorter than the calyx-lobes, white, flat, emarginate, furnished at the apex with 3 minute, clavate bristle-like processes and a strong middle nerve at the back of each petal. Stamens 10-12, alternately long and short, about as long as the petals. Fruit about 1″ long, cylindrical, tapering; radicle like that of *Rhizophora*, but grooved and ribbed, reddish-brown and about 6″ long by ·25″ thick.

Tidal forests from the Indus to Ceylon, Sundarbans, Australia; common in swamps along the Western peninsular coast. Fl. June-July. Fr. Aug.-Sept.

A large shrub or small tree. Bark dark-red coloured. Wood hard, orange-red, durable. Pores very small. Medullary rays fine, slightly wavy, crossed by interrupted, concentric bands of light tissue. Used for knees of boats in Sind and for house-posts in Lower Bengal; furnishes a very good fuel and excellent charcoal. "The bark is rich in tannin and is likely to be a valuable product; used for dyeing fishing nets on the Coromandel Coast." Gamble.

3. KANDELIA, Wight & Arnott.

A large shrub or small tree. Leaves opposite, simple, coriaceous Flowers in axillary cymes, large, white. Calyx 5-6-divided, subtended by the united bractlets; tube short, adnate to the ovary; lobes linear. Petals 5-6, bifid; lobes multifid; segments capillary. Stamens indefinite; filaments filiform; anthers small. Ovary ½-inferior, 1-celled; ovules 6, in pairs on a central column; style filiform, conical at the base; stigma 3-fid. Fruit 1-celled, 1-seeded; radicle fusiform, very acuminate.

K. Rheedii, W. & A. Prodr. 1, 310; Fl. Br. I. 2, 437; Brandis For. Fl. 218; Bedd. Fl. Sylv. 100; Cooke Fl. Pres. Bomb. 1, 474; Gamble Ind. Timb. 334. *Kandal,* M.

An evergreen shrub or small tree. Leaves elliptic-oblong, obtuse, 2″-4″ by 1″-2″, coriaceous, shining above, pale or glaucous beneath, narrowed at the base; petioles thick, ·5″ long; stipules ·75″-1·5″ long. Flowers in axillary cymes, few-flowered; peduncles 2″ long; bracts confluent. Calyx ·6″-·75″ long; lobes 5, linear, acute, valvate. Petals bifid, divided into numerous, capillary segments. Stamens numerous; filaments slender, unequal; anthers small, pink. Fruit ovoid, ·5″-1″ long, girt about the middle with the reflexed calyx-lobes; radicle 6″-15″ long, acuminate, neither ridged nor grooved.

Sundarbans and tidal shores of both peninsulas, also in Burmah and Bengal. Tidal swamps along the Western peninsular coast. Fl. June-July. Fr. Sept.-Oct.

A large evergreen shrub or small tree. Bark spongy, reddish-brown, flaky. Wood grey with a tinge of red, soft, close-grained. Pores very small, numerous. Medullary rays short and fine. Weighs about 40 lbs. to the cub. ft. The wood is used for firewood. "In Tavoy the bark is used for dyeing red." (Gamble.) The flower-buds ressemble those of *Alangium Lamarkii,* in size and shape.

Fig 290. Kandelia Rheedii, W. & A.

4. BRUGUIERA, LAM.

Evergreen trees. Leaves opposite, shining, coriaceous. Flowers rather large, solitary or few on recurved peduncles. Calyx 8-14-divided, without bracts

or bracteoles. Petals 8-14, inserted on the limb of the calyx, 2-cleft, embracing the stamens. Stamens 16-28, in pairs opposite the petals, springing elastically from them when mature. Ovary inferior, 2-4-celled, included in the calyx-tube; style filiform with 2-4 minute, stigmatic lobes; cells 2-ovuled. Fruit turbinate, 1-celled, 1-seeded. Germination as in *Rhizophora;* the protruded radicle elongate, clavate.

Peduncles 1-flowered. Radicle angled ... ... 1. B. gymnorhiza.
Peduncles 3-flowered. Radicle subacute, subclavate. 2. B. caryophylloides.
Peduncles many-flowered. Radicle sub-cylindric, truncated ... ... 3. B. parviflora.

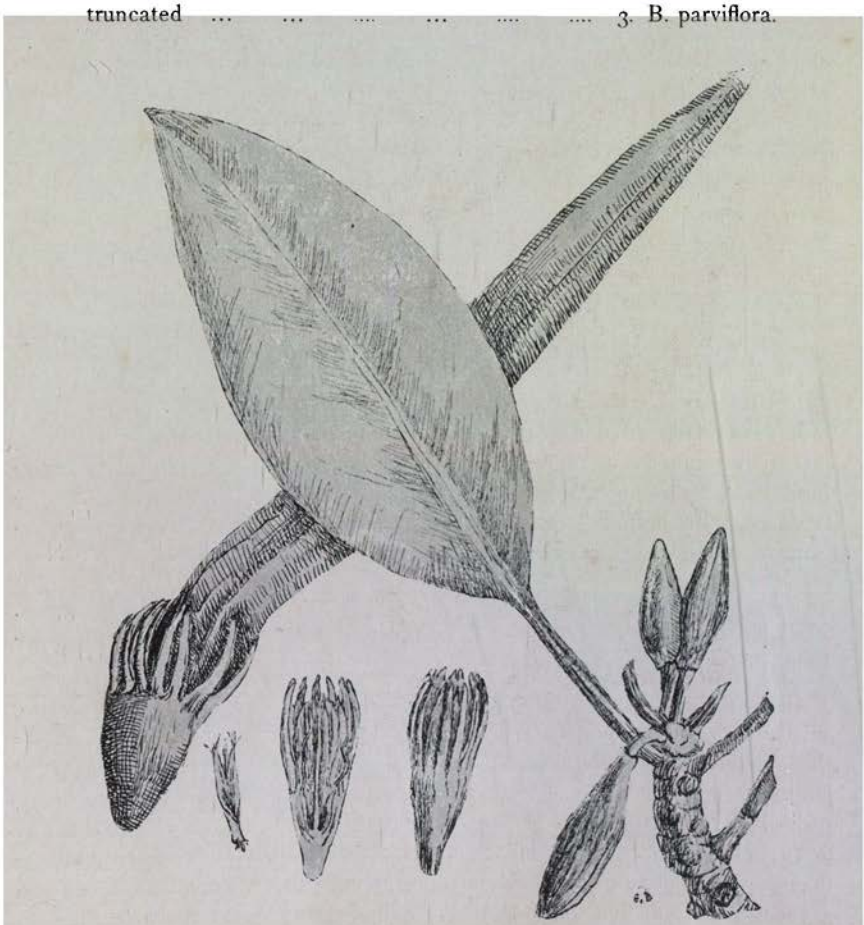

Fig 291. Bruguiera gymnorhiza, Lamk.

1. B. gymnorhiza, Lamk. Ill. t. 397; Fl. Br. I. 2, 437; Brandis For. Fl. 219; Cooke Fl. Pres. Bomb. 1, 474; Gamble Ind. Timb. 334; *B. Rheedii,* Blume; Dalz. & Gibs. Bomb. Fl. 95; Bedd. Fl. Sylv. 110.

A glabrous evergreen shrub, sometimes a large tree 80′ high. Leaves rather small, elliptic-oblong or obovate, acuminate, 4″-2·5″ by 1·5″-1″, thick, dark-green, shining above, paler beneath, gradually narrowed at the base into the petiole; midrib prominent beneath; petioles ·5″-·75″ long; stipules 1·5″-2·5″ long, early caducous. Flowers solitary, axillary; peduncles stout, deflexed, ·25″-·5″ long; buds ovoid, red-coloured, ribbed. Calyx 1″-1·5″ long, orange-yellow; tube campanulate; lobes 12-13, as long as the tube, narrow, acute, erect, keeled on the inner face. Petals shorter than the calyx-lobes and equal to them in number, membranous, bifid, with 2-4 bristles on the apex of each lobe and one in the notch. Stamens 2 opposite each petal and enclosed by it in bud, released elastically in the open flowers; stamens inserted with the petals on the disk lining the calyx-tube; filaments of each pair of anthers alternately long and short; anthers long, slender, apiculate. Style filiform; stigma with 4 minute lobes. Fruit turbinate, about ·75″ long, crowned by the scarlet calyx-segments which are ultimately deciduous; radicle brown, channelled, nearly the same thickness throughout, about 8″ by ·5″, more or less angled.

Sind, coasts of the peninsula, Burmah, Indian Archipelago and N. Australia, in littoral swamps and along creeks and tidal rivers. Fl. and Fr. R. S.

A large tree. Wood yellowish-brown, very hard and durable. Pores small, oval, subdivided. Medullary rays moderately broad, very numerous. Weighs 54 lbs. to the cub. ft. The wood is used for house-posts and articles of native furniture, it is also an excellent fuel. Equally common with *Rhizophora* in the N. Kanara, "Mangrove" formation. Prain says it is the chief constituent of the Mangrove jungles in the Cocos Islands.

2. B. caryophylloides, Blume. Mus. Bot. 1, 141; Fl. Br. I. 2, 438; Bedd. Fl. Sylv. 101; Brandis For. Fl. 219; Cooke Fl. Pres. Bomb. 1, 475; Gamble Ind. Timb. 334.

A small, evergreen tree, branched from the base. Leaves elliptic-lanceolate, subacute, or shortly acuminate, 4″-2·5″ by 1·75″-1″, cuneate at the base, rather thin, glabrous; midrib prominent beneath; petioles ·75″-1″ long; stipules 1″-2″ long. Flowers small, in axillary, 2-3-flowered cymes; peduncles about ·5″ long; pedicels very short. Calyx glabrous, about ·5″ long, not ribbed, divided halfway down; lobes about 8, linear, subacute. Petals white, 8, erect, concave, shorter than the calyx-lobes, hairy outside and on the margins, bifid at the apex and with 3-5 long bristles at the end of each lobe and a longer one in the sinus. Stamens 16, 2 opposite to each petal and shorter than it; filaments of each pair unequal.

Fruit small, yellow, about ·5″ long, ovoid-oblong, smooth; radicle brown, slender, cylindrical, curved, about 6″ by ·25″ before falling.

Tidal swamps along the coast from Malabar to Malacca, rare in Ceylon. Fl. and Fr. R. S. A small tree. "Bark dark-brown, thin. Wood reddish, hard, close-grained. Pores small, scanty. Medullary rays fine, numerous, wavy with a pretty silver grain." Gamble. Radicle same shape as that of *B. gymnorhiza.*

3. B. parviflora, W. & A. Prodr. 1, 311; Fl. Br. I, 2, 438; Bedd. Fl. Sylv. 101; Cooke Fl. Pres. Bomb. 1, 475; Gamble Ind. Timb. 334; *Kanilia parviflora,* Dalz. & Gibs. Bomb. Fl. 95.

An evergreen shrub; the slender young branches marked with the scars of the fallen leaves and stipules. Leaves 4″-3″ by 1·5″-1″, elliptic-lanceolate, shining above, dull beneath, cuneate at the base, crowded at the ends of the branchlets; petioles short, about ·5″ long; stipules 1″-2″ long. Flowers in lax, 2-5-flowered, erect cymes, longer than the petioles; pedicels slender. Calyx about ·5″ long; tube cylindric ribbed; lobes 8 about ¼th the length of the tube, acute, rigid, erect. Petals as many as the calyx-lobes and shorter than them, deeply bifid and bristly at the apex. Stamens twice as many as the petals, each pair enclosed within the incurved petal margins; filaments of each pair of stamens unequal. Ovary 3-celled; cells each with 2 ovules; style short; stigma 3-lobed. Fruit included in the enlarged calyx, about 1″ long; radicle subcylindric, furrowed, truncate, 4″-5″ long before falling.

Sundarbans to Malacca. Tidal swamps along the Western peninsular coast. Fl. and Fr. R. S.

A small tree or large shrub.

5. CARALLIA, Roxb.

Evergreen trees or shrubs. Leaves opposite, simple, ovate. Flowers small, often crowded in short branching cymes. Calyx with minute bracts at the base, shortly 5-8-lobed. Petals 5-8, inserted round the thin disk. Disk epigynous, 10-16-crenulate. Stamens usually twice as many as petals. Ovary inferior; style subulate or filiform. Fruit globose, 1-celled, 1-2 seeded. Seeds albuminous; testa fibrous; embryo curved.

C. lucida, Roxb. Cor. Pl. t. 211; Fl. Ind. 2, 481; Wight Ic. t. 605; Brandis Ind. Trees, 305; Kurz. For. Fl. 1, 451; Cooke Fl. Pres. Bomb. 476; *C. integerrima,* DC. Prodr. III, 33; Fl. Br. I. 2, 439; Bedd. Fl. Sylv. t. 193; Brandis For. Fl. 219; Dalz. & Gibs. Bomb. Fl. 95; Cooke Fl. Pres. Bomb. 1, 476; Gamble Ind. Timb. 334. *Shengali, panasi, punschi,* M.; *Andi, anda-murgal, makad-bhirand,* K. *C. lucida,* Roxb. cannot I think be kept distinct as suggested by Dr. Cooke

in his Fl. Pres. Bomb. 1, 476 (foot note) from *C. integerrima*, DC. I have not observed the ærial stilt-roots noted by Gamble on the tree as far north as Dehra Dun, in the Konkan or Western peninsular forests. The leaves are however often serrulate near the apex in this part of the habitat.

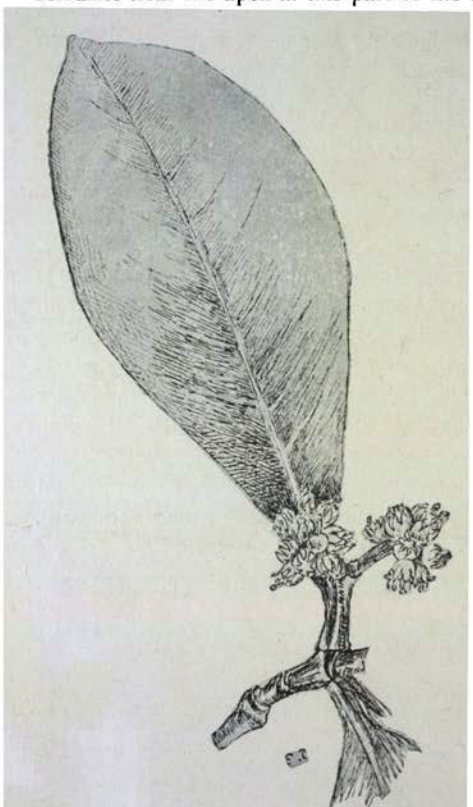

Fig 292. Carallia integerrima, DC.

A moderate-sized or large, evergreen tree, not a *"Mangrove swamp"* species; stipules large, ·75″ long, interpetiolar, caducous. Leaves elliptic, or obovate-oblong, rounded or bluntly acuminate at the apex, 4″-2″ by 2·5″-1″, entire or more or less serrulate at the end of the leaf, narrowed at base into the petiole, very coriaceous, glabrous, shining above, paler and glandular-dotted beneath; lateral-nerves about 12 pairs, anastomosing freely, not strong or conspicuous; petioles ·25″ long. Flowers yellowish-white, sessile, in small heads, arranged in short, axillary, peduncled cymes. Calyx ·20″ long, glabrous; lobes 7-8, about ½ the length of the campanulate tube, triangular, acute. Petals as many as the calyx-lobes, alternating with and shorter than them, clawed; limb irregularly fimbriate at the apex. Stamens twice as many as the petals and inserted with them on the margin of the thin, yellow, lobed disk. Ovary 4-celled; cells each with 2 pendulous ovules; stigma 4-5-lobed. Fruit globose, flattened, red, pulpy, size of a small pea, crowned with the calyx-teeth, 1-2-seeded. Seeds enclosed in a membranous sac, narrow horse-shoe shaped; episperm thin, brown, rugose; albumen white, copious; embryo green, slender, curved.

Forests of the outer Sikkim Himalaya, Bengal, Assam, Burmah; tropical and moist hill-forests of Pegu and Martaban up to 4000′; moist low country of Ceylon, China, Malay peninsula and islands to Australia, E. & W. peninsulas; throughout the tropical rain-forests of the Konkan and North Kanara. Flowers

in bud appear in August during the rainy season but do not open until Dec. to Feb. Fr. H.S. The inflorescence is covered with transparent resin. A moderate-sized, evergreen tree. Bark variable, thin, white or in very old trees corky; cork sometimes 1″-2″ thick. Sapwood grey or reddish grey; heartwood red, very hard, durable. Pores large or moderate-sized, often subdivided. Medullary rays both very broad and fine, numerous fine between each pair of broad rays. Weighs about 45 lbs. to the cub. ft. Bars of soft tissue and closed pores numerous and close between the broad rays. The wood has a fine, handsome silver-grain and is specially suitable for furniture and cabinet making.

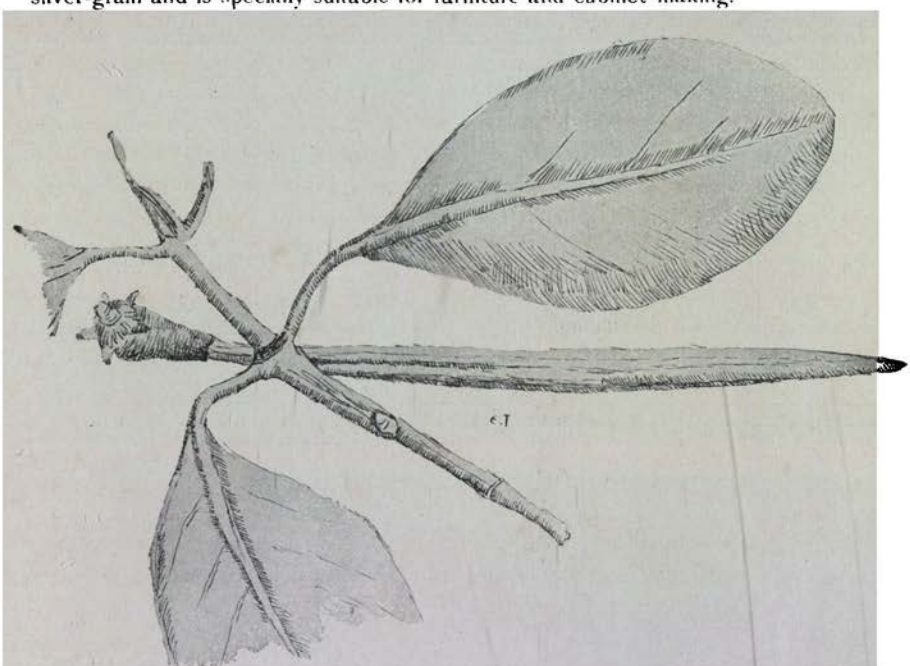

Fig 293. Ceriops Candolleana, Arn.

(See page 4.)

Order XLI.—COMBRETACEÆ.

Trees or shrubs. Leaves alternate, sub-opposite or opposite, petiolate, entire, exstipulate. Flowers regular, bracteate, usually bisexual, spikate or racemose, the racemes often panicled. Calyx-tube adnate to the ovary; limb 4-5-divided. Petals 4-5 or O, inserted on edge of calyx-tube and between its lobes. Stamens 4-5 or twice as many, inserted on the calyx; anthers longitudinally dehiscent. Ovary inferior, 1-celled; style simple; stigma usually simple; ovules 1-7, on large funicles, pendulous from the apex of the cell. Fruit 1-celled, 1-seeded, often winged, crowned by the enlarged calyx in *Calycopteris;* seeds exalbuminous; cotyledons oily, convolute or plano-convex; embryo straight; radicle superior.

A very important Order containing trees of great economic and sylvicultural value widely distributed throughout the Indian peninsular monsoon-forest region.

Petals O.
- Flowers spiked.
  - Calyx-limb deciduous ... ... 1. Terminalia.
  - Calyx-limb accrescent ... ... 2. Calycopteris.
- Flowers capitate. Calyx-limb deciduous ... 3. Anogeissus.

Petals 4-5.
- Trees.
  - Leaves alternate. Calyx-limb persistent ... 4. Lumnitzera.
- Climbing shrubs.
  - Calyx-tube short ... ... 5. Combretum.
  - Calyx-tube long, produced beyond the ovary ... 6. Quisqualis.

TERMINALIA, LINN.

Large trees. Leaves entire, petiolate, alternate, often with glands on the petiole or on the midrib beneath. Flowers sessile, small, greenish or white, usually bisexual, bracteolate. Calyx-tube adnate to and constricted above the ovary; limb 4-5-cleft, segments valvate, deciduous. Petals O. Stamens 10, in two rows on the calyx-lobes. Ovary inferior, 1-celled; ovules 2-3, pendulous from the apex of the cell; style subulate; stigma simple. Fruit ovoid, angular or winged, coriaceous, indehiscent.

Fruit not winged, ovoid, obovoid or globose.
- Fruit globular, tomentose ... ... 1. T. belerica.

Fruit ellipsoid or ovoid, glabrous, obscurely ridged when dry ... ... 2. T. Chebula.

Fruit with 3-7 longitudinal wings.

Wings of fruit subequal.

Bark white, smooth. Fruit with 5-7 narrow, subequal wings; wing-veins curving upwards ... 3. T. Arjuna.

Bark black, rough. Fruit with 5 subequal, broad wings; wing-veins straight, horizontal ... 4. T. tomentosa.

Wings of fruit unequal.

Fruit 3-winged; wings 1 large and 2 small ... 5. T. paniculata.

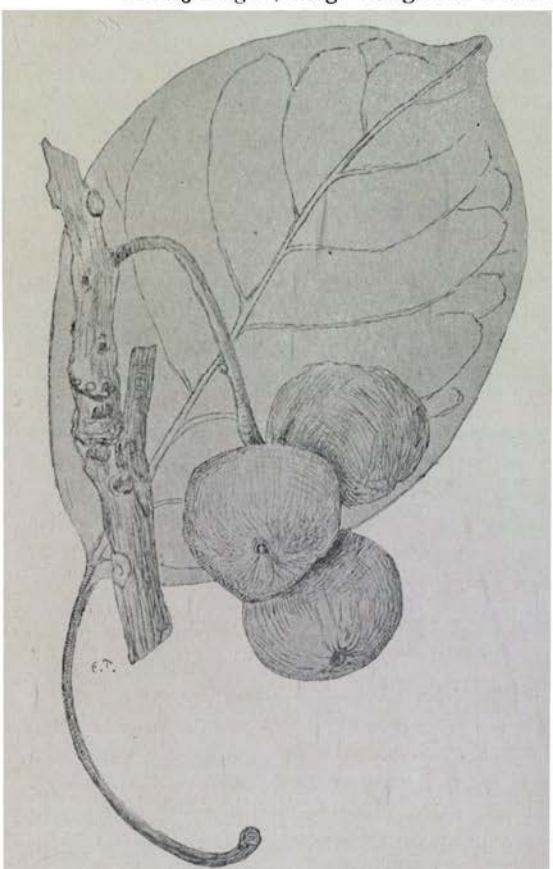

Fig 294. Terminalia belerica, Roxb.—*Fruit.*

1. T. belerica, Roxb. Fl. Ind. 2, 431; Fl. Br. I. 2, 445; Bedd. Fl. Sylv. t. 19; Dalz. and Gibs. Bomb. Fl. 91; Brandis For. Fl. 222; Gamble Ind. Timb. 337; Brandis Ind. Trees, 307. *Tare,* K.; *Goting, bherda, hela, yela, balra, balda,* M.; *Behedo,* Guz.

A large, deciduous tree, often buttressed at the base; branches horizontal, spreading. Leaves alternate, clustered at the extremities of the branchlets, obovate-oblong 4″-8″ by 3″-8″, obtuse or subacute at the apex, narrowed into the petiole at the base, entire with a pellucid margin, minutely puberulous when young, glabrous and reticulate when old, shining; on both surfaces, paler beneath; midrib and main-nerves about 8 pairs, prominent beneath; petioles 1·5″-4″ long, without glands at the apex. Flowers small, pale

yellowish-green with a strong, offensive smell, male and hermaphrodite mixed, in axillary, slender spikes shorter than the leaves, arranged in terminal panicles; rachis channelled, rufous-pubescent; bracts linear, soon caducous. Calyx ·20″ across, tomentose outside, densely villous within with long, brown, crisped hairs; teeth broadly triangular, deflexed. Fruit ovoid, 1·5″ long, narrowed at the base into a very short stalk with an irregular, rough, grey-tomentose surface; endocarp hard, woody, obscurely 5-angled, ultimately splitting up into 2 valves, each with very rough edges.

Sub-Himalayan tract from near the Indus eastwards, throughout India, Burmah and Ceylon; common in deciduous mixed monsoon-forest throughout the presidency, ascends to 3700′ in the Khandesh Akrani, neither found in Sind nor in Rajputana; scattered and not gregarious throughout the area of its distribution. Fl. May. Fr. next cold season. A large deciduous tree of rapid growth. Bark dark-grey, exfoliating in corky scales. Wood (no heart-wood) yellowish-grey, hard. Annual-rings indistinct. Pores large and small in broad, wavy bands of light tissue, alternating with darker tissue in which are the fine, uniform and distinct medullary rays. Not durable, liable to be attacked by insects. Weighs about 45 lbs. to the cub. ft. Used for packing cases, native boats, coffee boxes, etc. The timber if "Powellized" or otherwise rendered impervious against the attacks of white ants and dry rot would probably make excellent and cheap railway sleepers. The fruit is an inferior kind of *Myrobalan* and as such has been exported to Europe from Kanara but owing to the low grade quality of tan and dye extracted from it has not hitherto paid the cost of collection and transport. It is eaten by squirrels, monkeys, deer, goats and other animals, also used for making ink and as a purgative in native medicine. The kernels are eaten and exude on pressure 30-50 % of clear bland pale-yellow fatty oil which when allowed to stand deposits a flocculent white semisolid substance. The oil has a pleasant odour and nutty flavour and may prove a substitute for olive or other comestible oils. The trunk exudes copiously a gum insoluble in water and consequently of small commercial value. I have never found any glands on the blade of the leaf.

2. T. Chebula, Retz. Obs. 5, 31; Fl. Br. I. 2, 446; Brandis For. Fl. 223; Bedd. Fl Sylv. t. 27; Dalz. & Gibs. Bomb. Fl. 91; Watt Comm. Prod. Ind. 1073; Cooke Fl. Pres. Bomb. 1, 478; Gamble Ind. Timb. 338. *Anale,* K.; *Hirda, halra,* M.; *The Chebulic or Black Myrobalan Tree.*

A large, moderate-sized or small deciduous tree, often with a short crooked trunk and many spreading branches. Leaves alternate, often subopposite, 2·5″-6″ by 1·5″-3″, elliptic or ovate, acute or usually obtuse at the apex, rounded or narrowed into the petiole or cordate at the base, sometimes unequal-sided, coriaceous, pubescent when young, at length glabrous; lateral-nerves 6-8 pairs, prominent beneath; petioles ·5″-·75″ long with a large gland or swelling on each

side of the petiole at the top, on the base of the blade of the leaf. Flowers all hermaphrodite, ·2″ across, sessile, yellowish, odorous, early caducous, in axillary or panicled, short bracteolate spikes; bracteoles linear, acute, exceeding the flowers, very early caducous. Calyx cup-shaped, cleft into 5 broadly triangular lobes, hairy within Fruit pendulous, about 1·5″ long, obovoid from a cuneate base, more or less distinctly 5-angled; stone very hard and bony, obscurely angled; size and shape of fruit variable.

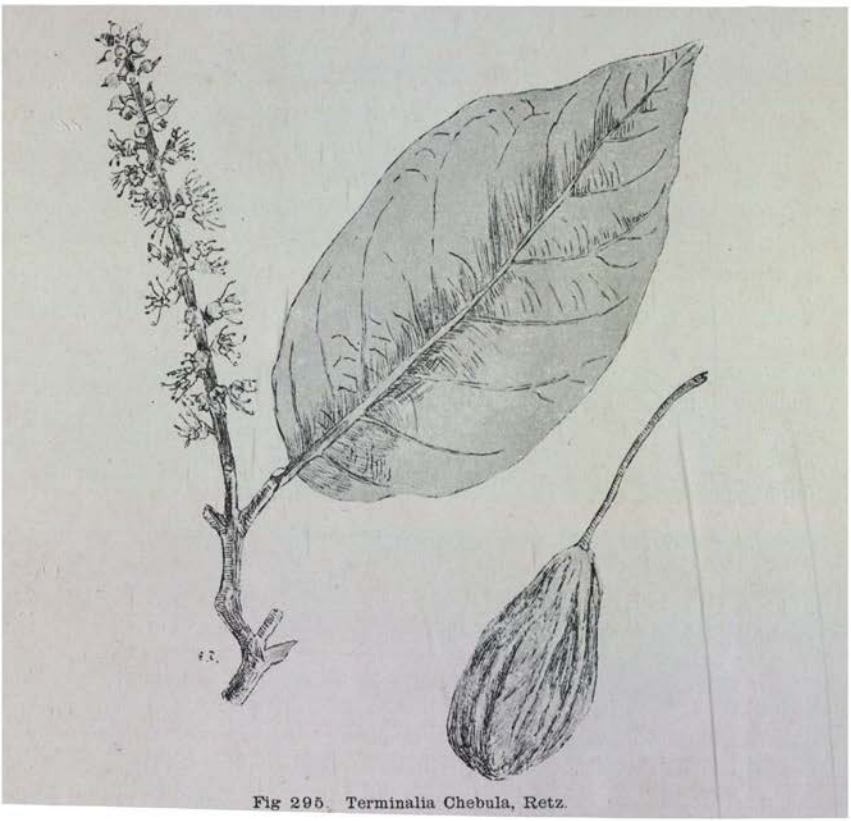

Fig 295. Terminalia Chebula, Retz.

Sub-Himalayan tract from the Sutlej eastwards, Bengal, Assam, Central, Southern and Western India. Throughout the Bombay presidency both in the moister parts of the Deccan on "Trap" and in the monsoon-forests of N. Kanara and Belgaum where it becomes a large tree under favourable conditions; common in the Khandesh Akrani up to 3700′ and along the Deccan ghâts. On the laterite of the Mahableshwar plateau at 4500′ the Hirda tree is one of the

principal constituents of the low elfin-wood forest. Bare of leaves during Feb., and the beginning of March. The fresh foliage and flowers appear simultaneously in March, April and May; the former usually of a coppery colour. Fruit ripe Dec. to March of the following year.

Bark dark-grey, rough with vertical fissures, exfoliating at the base of old trees in thick scales; inner bark reddish-brown, soft with white tissue close to the wood. Wood (no regular heart-wood) brownish-grey with masses of a purple colour near the centre, smooth, hard and close-grained, takes a good polish and is fairly durable. Pores moderate-sized, single or in groups included in wavy, interrupted lines of whitish tissue. Medullary rays very fine and uniform. Weighs about 70 lbs. to the cub. ft. Timber used for furniture, house-building, agricultural-implements and the construction of carts. Yields a gum, collected somewhat largely in the Berars and used for medicinal and dyeing purposes. The bark and dried, unripe fruit are also used for tanning and dyeing; the latter has from time immemorial been known as a powerful tonic and alterative medicine both in Europe and India. The principal product of the tree is however the black Myrobalan of commerce which yields one of the most valuable of Indian tans. The foreign trade in Myrobalans or Hirdas is very large. Considerably over a million cwts. valued at about 40,000 rupees, are annually exported from India to English and European continental ports. The produce of the Deccan forests is usually of a better quality than that from the southern districts of Kanara and Belgaum owing to late rains in the latter frequently spoiling part of the crop during collection.

3. T. Arjuna, Bedd. Fl. Sylv. t. 28; Fl. Br. I. 2, 447; Dalz. & Gibs. Bomb. Fl. 91; Brandis For. Fl. 224; Cooke Fl. Pres. Bomb. 479; Gamble Ind. Timb. 341; *T. Berryi*, Dalz. & Gibs. Bomb. Fl. 92. *Holematti,* K.; *Savimadat,* M.; *Kahu, arjun, (arjuna sadra* in Guzerat), Vern.

A large tree with a thick often buttressed trunk and characteristic smooth, white bark. Leaves mostly subopposite, 4″-6″ by 1·75″-2·75″, oblong or ovate-oblong, obtuse or subacute, often crenulate, rounded or cordate, sometimes unequal-sided at the base, glabrous, coriaceous; lateral-nerves 10-15 pairs, strong beneath; petioles ·25″ long with 2 prominent glands at the top beneath the blade. Flowers sessile, in short axillary spikes or in small axillary or terminal panicles; bracteoles minute, linear-lanceolate, shorter than the flowers, early caducous. Calyx campanulate, ·2″ across, nearly glabrous within and without; teeth small, triangular, acute. Ovary glabrous. Disk densely yellowish-hairy. Stamens much exserted. Fruit long with 5, thick, narrow, striated, usually truncate wings each about ·25″ broad.

Var. *angustifolia*, C. B. C. in Fl. Br. I. 2, 447; *Terminalia Berryi,* W. & A.

394; Dalz. & Gibs. 92; Cooke Fl. Pres. Bomb. 1, 479; *Pentaptera angustifolia*, Roxb. Hort. Beng. 34.

Leaves narrow, elongate, narrowed into the petiole, sometimes shortly acuminate at the apex. Part of the calyx-tube adnate to the ovary is densely rufous-tomentose outside. This variety is found along the N. Kanara and Konkan rivers also in Belgaum and Dharwar and throughout the Southern Mahratta country generally.

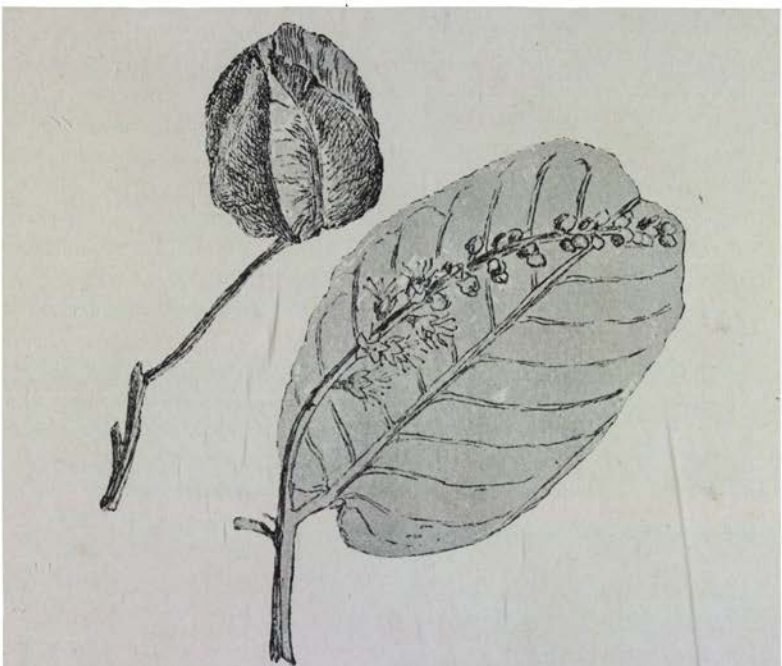

Fig 296. Terminalia Arjuna, Bedd.

Banks of rivers and streams throughout Bengal, Burmah, Central and Southern India and Ceylon. Planted along roadsides in the Belgaum district. Fl. Apl.-May. Fr. C. S. A large deciduous tree. Bark thick, smooth, pinkish-grey, exfoliating in thin plates or scales; inner-bark yellow, fibrous. Heartwood brown, very hard and difficult to work. Pores moderate-sized and large, surrounded by rings of whitish tissue. Medullary rays very fine, distinct and numerous, crossed by concentric anastomosing lines of light-coloured tissue. Weighs about 50 lbs. to the cub.ft. Used for carts, agricultural implements and boat-building purposes and in the Mysore gold field for mine supports. Yields a brown transparent

gum used as a drug in Northern India. The bark is employed in medicine as a tonic, also for dyeing and tanning.

4. T. tomentosa, W. & A. Prodr. 314 (not of Mart.); Gamble Ind. Timb. 341; Cooke Fl. Pres. Bomb. 479; Brandis Ind. Trees, 310; Bedd. Fl. Sylv. t. 17; Fl. Br. I. 2, 447; Dalz. & Gibs. Bomb. Fl. 91; Brandis For. Fl. 225. *Karimatti, madati,* K.; *Ain,* M.; *Sadri, hadri,* Guz.

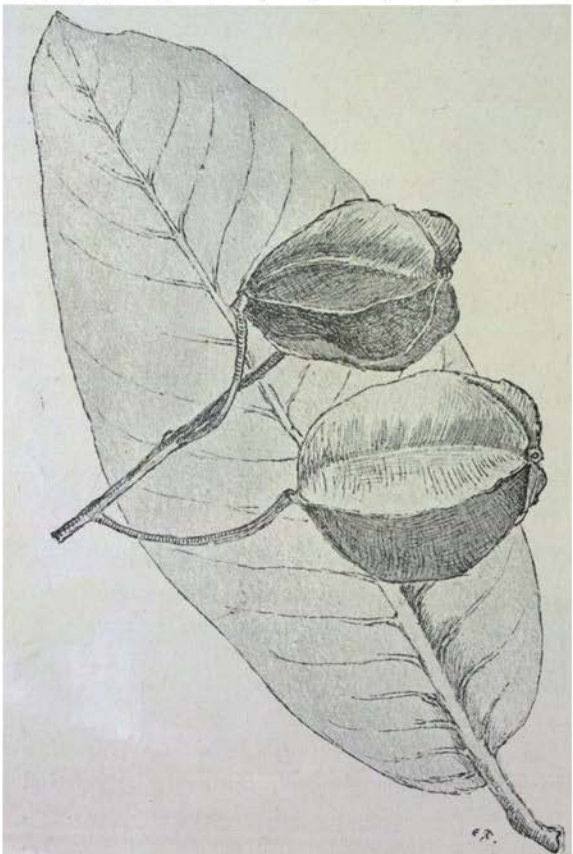

Fig 297. Terminalia tomentosa, Bedd.

A large, deciduous tree with a tall, regularly shaped trunk; young parts more or less yellowish-brown pubescent. Leaves subopposite or the uppermost alternate, coriaceous, elliptic or ovate, acute, acuminate or rounded at the apex, rounded, cordate or acute at the base, sometimes unequal-sided, 3″-8″ by 2″-3″, glabrous or softly silky-tomentose with 1-2 glands near the base of the midrib on the underside; margin entire or crenulate; main lateral-nerves parallel 10-20 pairs, prominent beneath; petioles .25″ long. Flowers hermaphrodite, dull-yellow, in erect terminal and axillary panicles. Calyx cup-shaped, hairy or glabrous outside; lobes 5, broadly ovate, acute. Disk fulvous-hairy. Fruit 1·5″-2″ long with 5, broad, coriaceous, horizontally-veined wings, thin and irregularly crenulate on the margins.

Common in the moist forest regions of India, Sub-Himalayan tracts of the N. W. Provinces, Nepal, Sikkim, W. Peninsula, Deccan, and from the Konkan southwards; common throughout the presidency in mixed deciduous monsoon-

forests, ascending to 3500′-4000′ on the Nasik ghâts and the Khandesh Akrani, absent from the laterite of the Mahableshwar plateau. At the higher elevations, in exposed situations, it is found as a low thick-stemmed tree with stout horizontal branches and a spreading crown. The leaves are sometimes densely grey-tomentose and both glabrous and tomentose foliage are often found on the same tree. The *Ain* prefers heavy binding clay soils on which it is often found gregarious; it reproduces easily from seeds and root-suckers and coppices freely. Fl. Apl. Fr. Feb.-Apl. of the following year. Bare of leaves during March; the fresh foliage comes out in April and May. A large deciduous tree with a characteristic thick, dark-coloured, deeply fissured bark. Sapwood reddish-white; heartwood dark-brown, hard, variegated with undulating darker streaks of colour. Pores moderate-sized, enclosed in light-coloured tissue, distinct or joined by lines. Medullary rays very fine, equally distributed, crossed by fine concentric lines at unequal distances. Weighs about 60 lbs. to the cub. ft. and for Kanara seasoned timber P = 615; durable, seasons well, decays slowly in N. Kanara on exposure to the weather in open depôt. Used for house-building, ships and boats. A valuable and well known timber, next to Teak the most important in this presidency. Although the supply is large the price of sound *Ain* logs is steadily rising in the Kanara and Belgaum markets and is now (1910) nearly 80 Rs. a ton. Yields excellent fuel. The bark is used for tanning, dyeing and medicinal purposes and the bark ashes consisting largely of carbonate of lime are sometimes chewed with betel nut. The copious gum which exudes from wounds in the bark and stem serves as incense also for tanning purposes and is sometimes eaten. The young branches and leaves are considered the best leaf-manure for the Supari palm gardens of the N. Kanara Haigas; they are also converted into wood-ash so largely used in the fields of the Konkan and Konkan ghât districts. *Ain* stands lopping and pollarding for a number of years but succumbs to the treatment at a comparatively early age. In the Konkan the name *Kari* or *black-matti* distinguishes this species from *bili* or *white-matti (Terminalia paniculata)*. *Bili-matti* is also a Kanarese name for *Terminalia Arjuna* in the Mysore gold fields.

Fig 298. Terminalia sp.—*Seedling.*

Kari-matti trees in Kanara suffer from a curious disease caused by the local decay of the sapwood which becomes filled with much water and is visible as large swellings or blisters on the outside of the trunk.

5. T. paniculata, Roth. Nov. Sp. 383; Fl. Br. I. 2, 448; Dalz. & Gibs. Bomb. Fl. 92; Bedd. Fl. Sylv. t. 20; Brandis For. Fl. 226; Cooke Fl. Pres. Bomb. 1, 480; Gamble Ind. Timb. 344. *Kindal, kinjal,* M.; *Honal, ulvi, hongal, hunab, bili-matti,* K.; *Kirijul,* Vern.

A large or very large, deciduous tree; young parts rusty-tomentose. Leaves coriaceous, alternate or subopposite, 4″-9″ by 1·75″-3·5″, oblong, acute or acuminate, rounded or cordate, often unequal-sided at the base, glabrous, pale-brown beneath and with 1-2 glands at or usually near the base of the midrib; lateral-nerves 10-15 pairs. Flowers sessile, in slender spikes arranged in large, spreading panicles; bracts ovate, acute, recurved, about ·2″ long. Calyx ·2″ long, cup-shaped, globose in bud, reddish-brown hairy within; teeth short, broadly triangular, glabrous outside, densely villous within. Disk clothed with long, yellowish hairs. Ovary densely hairy. Fruit brick-red coloured, closely set in large, conspicuous, panicles, densely tomentose, unequally 3-winged the 2 smaller, one on either side of the thickened base of the larger; larger wing oblong, about ·5″ by ·25″, horizontally veined.

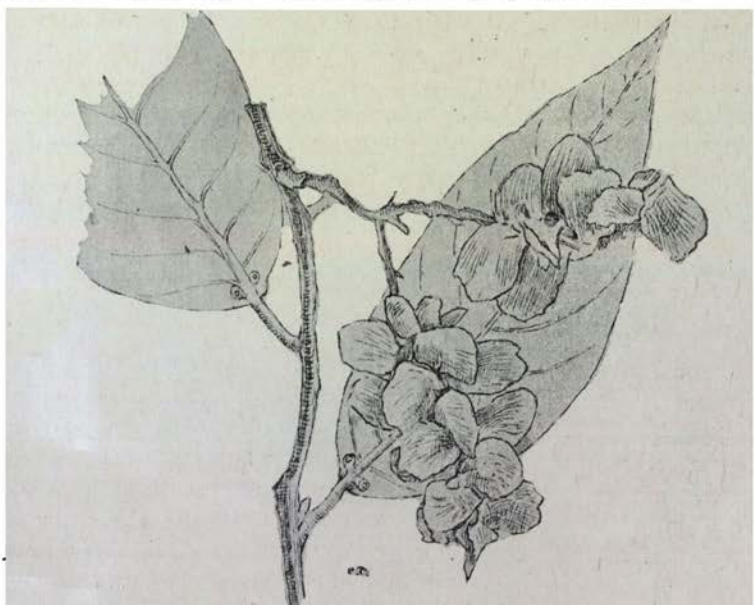

Fig 299. Terminalia paniculata, Roth.

Western peninsula from Bombay southwards. Throughout the presidency in mixed deciduous forests, one of the most common trees in North Kanara, rare on the Deccan trap, absent from the Dangs and Satpuras. Fl. Aug.-Sept. Fr. ripe Dec.-May.

A large tree. Bark rough, brownish-black, with numerous shallow longitudinal and transverse fissures; inner-bark red, mottled, ·25″ thick, very distinct from that of the *Kari-matti* tree. Heartwood light-brown, smooth, very hard. Pores moderate-sized and small, enclosed in whitish tissue, sometimes joined by concentric broken somewhat faint lines of light-coloured tissue. Medullary rays fine, uniform, distinct. Weighs 53 lbs. to the cub. ft., fairly durable. Value of P=628. Makes good planking and might be tried for railway sleepers in damp localities. Bark contains much tannin.

T. Catappa, Linn.; Willd. Sp. Pl. IV, 967; Fl. Br. I. 2, 444; Bedd. Fl. Sylv. t. 18; Dalz. & Gibs. Bomb. Fl. Suppl. 33. *Bengali-badam,* H. Planted in the Konkan and North Kanara. A native of the Molluccas. Fl. C. S. Fr. R. S.

2. CALYCOPTERIS, Lamk.

A large, diffuse or scandent shrub. Leaves opposite, ovate, entire. Racemes dense, forming large terminal or axillary panicles. Flowers greenish, bracteate. Calyx-tube elongate-turbinate, 5-striate, constricted above the ovary; limb 5-fid, much enlarged in fruit. Petals O. Stamens 10, biseriate. Ovary 1-celled, inferior; ovules 3, pendulous from the top of the cell; style subulate; stigma simple. Fruit 5-ribbed, villous, 1-seeded, crowned by the enlarged calyx.

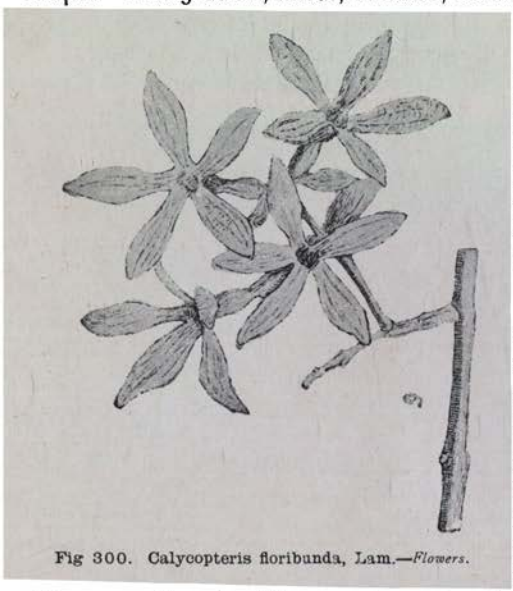

Fig 300. Calycopteris floribunda, Lam.—*Flowers.*

C. floribunda, Lam. Dict. Supp. 2, 41; Fl. Br. I. 2, 449; Brandis For. Fl. 220; Cooke Fl. Pres. Bomb. 1, 481; Gamble Ind. Timb. 345; *Getonia floribunda,* Roxb.; Dalz. & Gibs. Bomb. Fl. 91. *Ukshi,* M.; *Wuksey, baguli,* Vern.; *Bili-yadi,* K.

A large shrub with drooping branches; branchlets and shoots rusty-villous. Leaves opposite, 3″-5″ by 1·5″-2·25″, ovate-lanceolate, acute or acuminate, coriaceous, glabrous, shining above, rusty-tomentose and densely covered with brown dots beneath; lateral-nerves 5-8 pairs, prominent beneath; petioles ·25″-·5″ long. Flowers sessile, yellowish-green; bracteoles short, lanceolate, pubescent. Calyx

tomentose at the mouth of the tube; lobes accrescent in fruit, scarious, about ·75″ by ·25″, broadly linear-lanceolate, more or less pubescent, 3-basal-nerved and reticulately veined. Stamens unequal, shorter than the calyx-lobes. Fruit ellipsoid, ·3″ long, 5-ribbed, crowned by the calyx-lobes.

Central and Southern India; throughout the presidency in deciduous forests. Fl. Mch.-Apl. Fr. Apl.-May.

Stems 6″-12″ in diameter. Bark grey with a thin layer of corky tissue, nearly smooth; inner-bark white, not fibrous. Wood yellowish, light, moderately hard. Pores small or large, numerous. Medullary rays very fine, numerous. Numerous small medullary masses of soft tissue appearing crescent-shaped on a cross section afford a very distinctive character. Weighs 30 lbs. to the cub. ft. Used for making tool-handles. Bark used in native medicine.

3. ANOGEISSUS, Wall.

Trees or shrubs. Leaves alternate, entire. Flowers small, yellow, bisexual, in globose, axillary heads on slender peduncles. Calyx-tube compressed, 2-winged at the base, long attenuated above the ovary; limb small, campanulate or urceolate, deciduous. Petals O. Stamens 10, in two series; filaments exserted; anthers small, cordate, versatile. Ovary inferior, 1-celled; ovules 2, pendulous from the top of the cell; style filiform, thickened at the base, villous; stigma simple. Fruit small, 2-winged, terminating in a beak formed by the persistent calyx-tube, in dense, globose heads. Seed 1; cotyledons convolute.

Beak as long as or longer than the winged fruit.
Fruit glabrous; wing-margins entire ... ... 1. A. latifolia.
Fruit tomentose; wing-margins jagged... ... 2. A. sericea.
Beak shorter than the winged fruit ... ... 3. A. pendula.

1. A. latifolia, Wall.; Bedd. Fl. Sylv. t. 15; Fl. Br. I. 2, 450; Brandis For. Fl. 227; *Conocarpus latifolia*, DC.; Dalz. & Gibs. Bomb. Fl. 91. *Dindal, dinduga,* K.; *Dhaura, dandua, dhaori,* M.; *Dabria,* Vern.

A large deciduous tree; young parts silky, rusty-pubescent or glabrous. Leaves alternate or subopposite, ovate or oblong-elliptic, 2·5″-4″ by 1·25″-2″, obtuse or very shortly abruptly-cuspidate, coriaceous, glabrous or tomentose, rounded or subcordate at the base; lateral-nerves 8-14 pairs arching upwards, prominent beneath; petioles ·25″-·5″ long, channelled. Flowers sessile, in dense heads, ·25″-·4″ in diameter, on short peduncles which are single or in axillary racemes about as long as the petioles. Calyx-tube more or less pubescent or glabrous; teeth short, broadly triangular. Fruits nearly glabrous, crowded in a globose head, plano-convex, laterally winged and long-beaked, yellowish-brown.

Var. villosa, C. B. Clarke in Fl. Br. I. 2, 450. Leaves 2″ by 1·25″, coriaceous, sometimes repand on the margins and densely tomentose on both sides. Beak of fruit tomentose and usually shorter than the winged part.

Dry open thorn-forest in the Nasik district. Mysore, C. B. C.

Fig 301. Anogeissus latifolia, Wall.

From the Himalayas to Ceylon; very common throughout the presidency, usually in dry forests, sometimes gregarious. Fl. May-June. Fr. Nov.-Feb. A large or moderate-sized, deciduous tree. Bark white, scaly, smooth, exfoliating in irregular scales; inner-bark purple, compact. Sapwood yellowish; heartwood small, dark-brown, very hard. Pores small, numerous, often divided, included in light-coloured tissue. Medullary rays very fine and numerous, uniform, equidistant. Annual-rings visible, marked by rings of darker tissue. Weighs about 60 lbs. to the cub. ft. Used for furniture, carts, agricultural implements, ship-building, etc. The timber is not durable, except when kept dry, is liable to warp and split in

seasoning, but is in demand, makes very good charcoal. The stems yield an excellent hard gum employed in cloth printing.

2. A. sericea, Brandis in Ind. For. 25, (1900) 287; Cooke Fl. Pres. Bomb. 1, 483; Brandis Ind. Trees, 315; Gamble Ind. Timb. 347.

A medium-sized or large tree; young shoots clothed with silvery pubescence; branchlets and underside of leaves silky-hairy. Leaves elliptic, 1″-1·5″ by ·75′-1″, shortly acuminate, apiculate, glabrescent above, silky-pubescent beneath; lateral-nerves 4-6 pairs; petioles ·12″ long, pubescent. Flowers in globose heads, ·5″-·75″ in diameter, on long peduncles; peduncles axillary, frequently with leafy bracts. Fruit tomentose, broader than long; wings with jagged margins and prolonged upwards into 2 triangular lobes; limb of calyx often subpersistent.

Common on the Panchmarhi hills, ascending to 4000′, Rajputana and Guzerat (Panch Mahals). Apparently a rare tree in the Bombay Presidency; hitherto only noted by Dalzell from the Panch Mahals district.

3. A. pendula, Edgw. in Jour. As. Soc. Beng. 21, 171; Brandis Ind. Trees, 395; Gamble Ind. Timb. 348; Cooke Fl. Pres. Bomb. 1, 483.

A small, gregarious tree with pendulous branches; young parts pubescent. Leaves ·75″-1·25″ by ·4″-·6″, elliptic, broadly lanceolate or oblanceolate, more or less densely pubescent on both sides or sometimes glabrous; lateral-nerves 5-7 pairs, not prominent; petioles ·12″ long. Flower-heads small, less than ·25″ in diameter, on solitary, axillary, slender peduncles ·5″-1″ long. Ripe fruit nearly orbicular, the beak less than ½ the length of the fruit.

N. W. Provinces, Rajputana and Bundelkhand southwards to Guzerat (Panch Mahals). The principal tree in the Merwara and Meywar forests. Fl. R. S. Bare of leaves in Jan. Apparently very rare in the Bombay Presidency.

4. LUMNITZERA, WILLD.

Evergreen trees or large shrubs, growing in coastal salt marshes along with mangroves. Leaves fleshy, simple, alternate, clustered towards the ends of the branches. Flowers bisexual, in short axillary or terminal spikes or racemes. Calyx-tube elongate, bracteolate; limb bell-shaped, 5-lobed, persistent. Petals 5, spreading. Stamens 5-10; anthers cordate. Ovary 1-celled; ovules 2-5, pendulous; style filiform, glabrous; stigma simple. Fruit woody, obtusely angular, 1-seeded; cotyledons convolute.

L. racemosa, Willd.; DC. Prodr. III, 22; Fl. Br. I. 2, 452; Dalz. & Gibs. Bomb. Fl. Sylv. 103; Brandis For. Fl. 221; Gamble Ind. Timb. 348; Cooke Fl. Pres. Bomb. 1, 483.

Fig 302. Lumnitzera racemosa, Willd.

A large glabrous shrub or small tree. Leaves alternate, fleshy, sessile, crowded at the ends of the branches, 1″-2·5″ by ·5″-·75″, oblanceolate-oblong, rounded or emarginate at the apex, much tapering at the base, entire or more or less shallow-crenate, glabrous, shining; lateral-nerves 3-5 pairs, very indistinct. Flowers small, sessile, in short lax, axillary spikes. Calyx-tube quite glabrous, fusiform, about ·5″ long; teeth shallow obtuse, ciliolate; bracteoles 2, adnate to the calyx-tube, about ·1″ long; one higher than the other on the tube. Petals oblong, acute. Stamens 10, as long as the petals; the alternate filaments shorter. Fruit oblong-ovoid, ·5″-·75″ long, glabrous, longitudinally striate when dry, crowned with the persistent calyx-tube.

Coasts of India, Ceylon, Burmah, Tropical Africa and the tropics, generally in mangrove swamps, South Konkan along salt-water creeks and back-waters; common at the mouth of the Kala-nuddi near Karwar. Fl. Mch.-Apl. Fr. Sept. Bark ·25″ thick, dark-coloured, hard and rough. "Wood greyish-brown with a small darker heart-wood, hard. Pores small, uniformly distributed, often sub-divided or in short radial lines. Medullary rays fine, numerous. Weighs 54 lbs. to the cub. ft." Gamble.

5. COMBRETUM, Linn.

Shrubs, usually climbing. Leaves opposite, seldom alternate, simple. Flowers polygamo-dicecious, often in panicled spikes or racemes, minutely bracteolate. Calyx-tube adnate to the ovary; limb 4-5-divided, segments valvate. Petals 4-5 or O. Stamens as many or twice as many as the calyx-segments. Ovary inferior, 1-celled; ovules 2-5, pendulous; style subulate; stigma simple. Fruit 4-5-winged or angled. Seed 1; cotyledons plaited, flat or convoluted.

Tube of calyx cup-shaped, equalling the ovary.
Fruit with 4 papery wings ... ... 1. C. ovalifolium.
Tube of calyx funnel-shaped, longer than the ovary.
Fruit with 4 membranous wings ... ... 2. C. extensum.

1. C. ovalifolium, Roxb. Fl. Ind. 2, 256; Fl. Br. I. 2, 458; Dalz. & Gibs. Bomb. Fl. 90; Cooke Fl. Pres. Bomb. 1, 484; Gamble Ind. Timb. 348. *Zelloosey, madbel,* Vern.

A large, straggling or climbing, nearly glabrous shrub; branches numerous, stiff, divaricate, thickened at the nodes. Leaves opposite, coriaceous, elliptic, rounded or very shortly acuminate at the apex, 2″-4″ by 1·2″-2·5″, glabrous, shining above, paler and brownish-hairy at base of midrib beneath; lateral-nerves about 6 pairs, distinct; petioles stout, channelled, ·5″-·75 long. Flowers white,

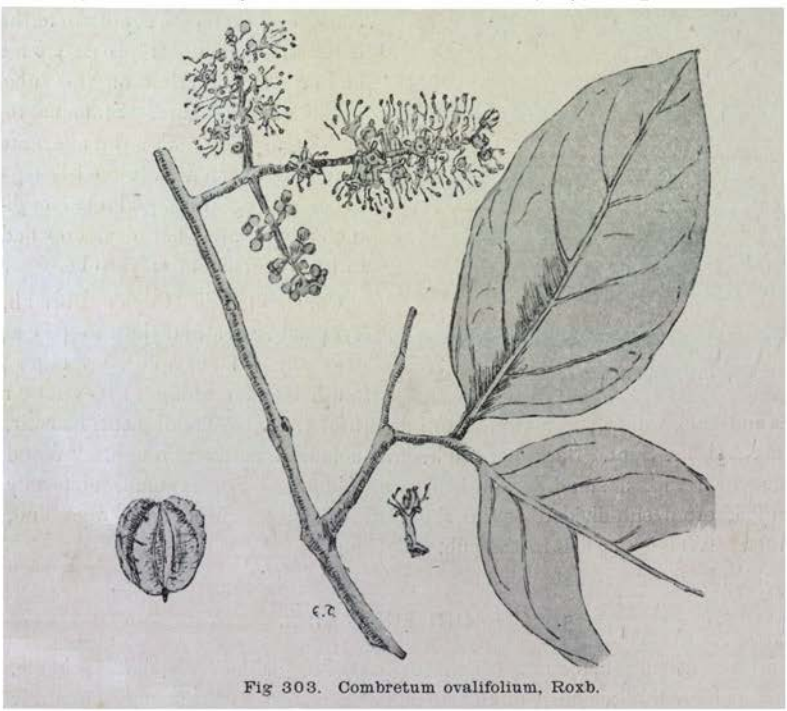

Fig 303. Combretum ovalifolium, Roxb.

sessile, ·25″ long, in short, dense, panicled, axillary spikes; buds globose, apiculate; bracteoles minute. Calyx-tube glabrous outside, constricted into a short neck above the ovary then suddenly expanded into a cup-shaped limb hairy at the base within; lobes 4, triangular, acute, reflexed. Petals oblong, as long as the calyx-

lobes. Disk hairy. Fruit pale-golden-brown, 1″-1·5″ long; wings ·5″ wide, stiff, papery, glabrous, finely transversely striate; seed 4-sided.

The Deccan peninsula and Ceylon. Throughout the presidency in deciduous forests. Fl. Feb. Fr. May. The twigs are tough and flexible. Yields a kind of gum.

2. C. extensum, Roxb. Fl. Ind. 2, 229; Fl. Br. I. 2, 458; Cooke Fl. Pres. Bomb. 1, 485; Gamble Ind. Timb. 349; *C. Wightianum,* Wall.; Dalz. & Gibs. Bomb. Fl. 458. *Piloka,* Vern.

A large, straggling or scandent, nearly glabrous shrub. Leaves opposite, coriaceous, broadly ovate, acute or very shortly acuminate, rounded at the base, 4″-9″ by 3″-6″, glabrous; petioles channelled, ·5″-·75″ long. Flowers sessile, deflexed on the puberulous rachis about ·5″ long, in short, densely flowered, usually simple, axillary, sometimes panicled spikes; buds pointed. Calyx-tube contracted above the ovary and suddenly expanding into a funnel-shaped limb, hairy within; lobes 4, acuminate, acute, reflexed. Petals yellowish-white, oblong, truncate or slightly emarginate at the apex, shorter than the calyx-lobes. Disk hairy. Fruit including the wings 1·25″ long and nearly as broad; wings scarious, glabrous, horizontally striate.

Deccan peninsula, Ceylon, Trans-Gangetic peninsula, from Silhet to Singapore. Throughout the moist forests of the Konkan and North Kanara. Fl. Feb. Fr. May. A large scandent shrub. Bark light-brown, fluted. Wood brown, porous.

6. QUISQUALIS, Linn.

Rambling shrubs. Leaves opposite. Flowers white or red, axillary and terminal, in short spikes. Calyx-tube long-produced. Petals 5. Stamens 10. Ovary 1-celled. Fruit 5-angled or winged, dry.

Q. indica, Linn. Sp. Pl. 556; Fl. Br. I. 2, 459; Brandis For. Fl. 220; Dalz. & Gibs. Bomb. Fl. Suppl. 33. *Rangoon Creeper.* Indigenous in Java and the Malay Archipelago. Cultivated in gardens as an ornamental plant throughout the presidency. Fl. May-Sept. Rarely produces fruit in Bombay.

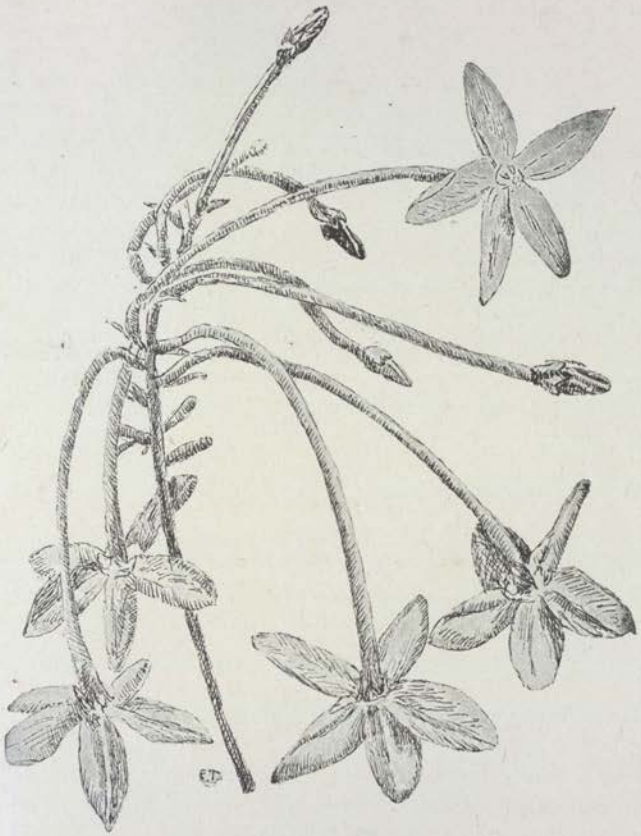

Fig 304. Quisqualis indica, Linn.

Order XLII—MYRTACEÆ.

Trees or shrubs. Leaves opposite, simple, usually coriaceous and pellucid gland-dotted, with an intramarginal vein; stipules minute, deciduous or wanting. Flowers regular, usually hermaphrodite. Calyx adnate to ovary, rarely produced beyond it, 4-5 or more divided. Disk lining the calyx-tube. Petals as many as calyx-lobes, inserted on the margin of the disk, surrounding cavity of calyx, usually much imbricate in bud and more or less connate into a deciduous cap. Stamens usually many. Ovary inferior or ½-inferior, crowned by the fleshy disk, 1-celled, 1-ovuled or 2-many-celled with many ovules on axile placentas; style simple; stigma small, capitate or peltate. Fruit crowned with the calyx-limb, dehiscent or indehiscent. Seeds angular; albumen O; embryo straight, curved or spirally twisted; cotyledons rarely leafy, usually short and obtuse; radicle often thick.

Divided into two distinct groups, the first containing the tribes *Leptospermeæ* and *Myrteæ* and the other the *Lecythidaceæ*. These are considered as distinct natural orders by some authors. The *Myrtaceæ* is an order of considerable importance to the Indian forester containing as it does a number of widely spread useful indigenous timber and fruit trees. The tribe *Leptospermeæ* is represented by several introduced species of the Australian genus *Eucalyptus* which are largely cultivated in the Nilghiris and other mountains of Southern India.

Leaves usually opposite and dotted with pellucid glands. Fruit a berry or drupe. *(Myrteæ)*

- Berry many-seeded. ... ... 1. Psidium.
- Berry few-seeded. ... ... 2. Eugenia.

Leaves alternate, not gland-dotted. Fruit angular fibrous or globose fleshy. *(Lecythidaceæ)*

- Fruit angular fibrous, one-seeded ... ... 3. Barringtonia.
- Fruit globose fleshy, many-seeded ... ... 4. Careya.

1. PSIDIUM, LINN.

Trees or shrubs. Leaves opposite, entire, not gland-dotted. Flowers on axillary peduncles, large, white. Calyx-tube ovate; limb valvately 4-5-lobed. Petals 4-5. Stamens many. Ovary 2 or more celled; ovules many. Fruit a many-seeded berry.

P. Guayava, Linn.; Benth. Fl. Hongk. 120; Fl. Br I. 2, 468; Brandis For. Fl. 232; Gamble Ind. Timb. 355; Cooke Fl. Pres. Bomb. 1, 498; *P. pyriferum,* W. & A.; Dalz. & Gibs. Bomb. Fl. Suppl. 34. *The Guava Tree. Jam, peru,* Vern.

Indigenous in Mexico; cultivated for its excellent edible fruit throughout the presidency, naturalised in many places. Fl. Apl.-May. Fr. R. S. A small evergreen tree with smooth grey bark exfoliating in thin flakes. Wood reddish-white, moderately-hard and even-grained. Pores small, numerous, single or in short rows. Medullary rays fine, numerous. Annual-rings distinct. Weighs about 40lbs. to the cub. ft. "Used for wood engraving, spear handles and instruments" (Gamble). The bark is astringent and is employed medicinally.

2. EUGENIA, LINN.

Evergreen trees or shrubs. Leaves opposite, coriaceous or membranous, penni-nerved, with a more or less conspicuous intramarginal vein, exstipulate. Flowers in lateral or terminal trichotomous cymes or panicles; bracts usually small and deciduous. Calyx-tube globose or more or less elongate; lobes 4, rarely 5. Petals usually 4, free and spreading or united in a deciduous calyptra. Stamens many, in several series, free or slightly collected in four bundles. Ovary 2, rarely 3-celled; ovules several in each cell; style filiform; stigma small. Fruit a berry, 1 or several-seeded, crowned with the persistent calyx-limb. Seeds few, globose; testa membranous or cartilaginous; embryo thick and fleshy; radicle short; cotyledons thick, more or less united or distinct.

Flowers cymose, large, showy, 4-merous. Calyx with a thickened staminal-disk. Petals spreading.
Trees. Sect. *Jambosa.*
Flowers red, in dense cauliflorous, short-peduncled racemes ... ... 1. E. malaccensis.
Flowers white, terminal and axillary.
Calyx-tube broadly turbinate ... ... 2. E. Jambos.
Calyx-tube hemispherical ... ... 3. E. hemispherica.
Calyx-tube slender. Stamens crimson ... 4. E. læta.

Flowers small, in compact cymes. Calyx without a thickened staminal-disk. Petals calyptrate or free.
Trees. Sect. *Syzygium.*
Petals free.
Flowers axillary, racemose. Calyx elongate. 5. E. Wightiana.
Flowers in corymbs. Calyx shorter ... ... 6. E. zeylanica.

Petals calyptrate.
Calyx-tube shortly turbinate, limb indistinct.
Branches 4-angled. Leaves lanceolate ... 7. E. lissophylla.
Branches terete. Leaves ovate, acuminate or obtuse.
Flowers sessile.
Cymes longer than the leaves ... ... 8. E. corymbosa.
Cymes shorter than the leaves ... ... 9. E. utilis.
Flowers pedicelled. Calyx broadly turbinate 10. E. kanarensis.
Calyx-tube slender and tapering, limb 4-5-lobed.
Leaves indistinctly nerved, dots not pellucid 11. E. Stocksii.
Leaves distinctly nerved, dots pellucid.
Cymes short, compact, below the leaves 12. E. Jambolana.
Cymes lateral, lax from the scars of fallen leaves, much branched ... ... 13. E. Heyneana.
Flowers solitary or fascicled. Petals distinct.
Small trees or shrubs. Sect. *Eueugenia.*
Branchlets etc. pubescent. Staminal-disk broad.. 14. E. macrosepala.
Glabrous. Staminal-disk not enlarged.
Flowers peduncled. Fruit small ... ... 15. E. Mooniana.
Flowers sessile. Fruit large ... ... 16. E. memecylifolia.

1. E. malaccensis, Linn.; Lam. Dict. III. 196; Fl. Br. I. 2, 471; Bedd. Fl. Sylv. 110; Cooke Fl. Pres. Bomb. 1,495; Gamble Ind. Timb. 357; Brandis Ind. Trees, 318; *Jambosa malaccensis,* DC.; Dalz. & Gibs. Bomb. Fl. Suppl. 35. *Malay Apple or Kavika Tree. Malacca-jam,* Vern.; *Jamb, neerl,* K.

A moderate-sized, evergreen tree. Leaves elliptic-lanceolate or oblanceolate, shortly acuminate, cuneate at the base, 6″-9″ by 3·5″-4″, thinly coriaceous, glabrous, dark-green, shining above, paler beneath; lateral-nerves 10-20 pairs, arching and looping near the margin; petioles stout, channelled, ·25″-·5″ long. Flowers bright-crimson, sessile, 1″-1·5″ across, arranged in fasciculate, sessile or pedunculate cymes (usually in 3s) from the old wood. Calyx-tube funnel-shaped, ·7″ long; lobes semi-orbicular, scarious on the margins, ·3″ in diameter. Petals free, ·5″ long, suborbicular, clawed. Stamens numerous, about 1″ long. Fruit turbinate or ovoid, 2″ long, smooth, glossy, crowned with the incurved, persistent calyx-lobes, varying from white to purple in colour.

Native of the Malay Archipelago. Cultivated in the supari-palm gardens of North Kanara also near and in Bombay. Fl. Apl. May. Fr. C. S. Wood reddish-

grey, rough, soft. Pores moderate-sized and large. Medullary rays broad. Weighs 38 lbs. to the cub. ft. Produces a juicy, insipid fruit.

2. E. Jambos, Linn.; Fl. Br. I. 2, 474; Brandis For. Fl. 233; Bedd. Fl. Sylv. 110; Cooke Fl. Pres. Bomb. 1, 495; Gamble Ind. Timb. 357; Brandis Ind. Trees, 318; *Jambosa vulgaris*, W. & A.; Dalz. & Gibs. Bomb. Fl. 35. *The Rose Apple, Gulab-jaman, sakara-jambha*, Vern.; *Pun-neerl*, K.

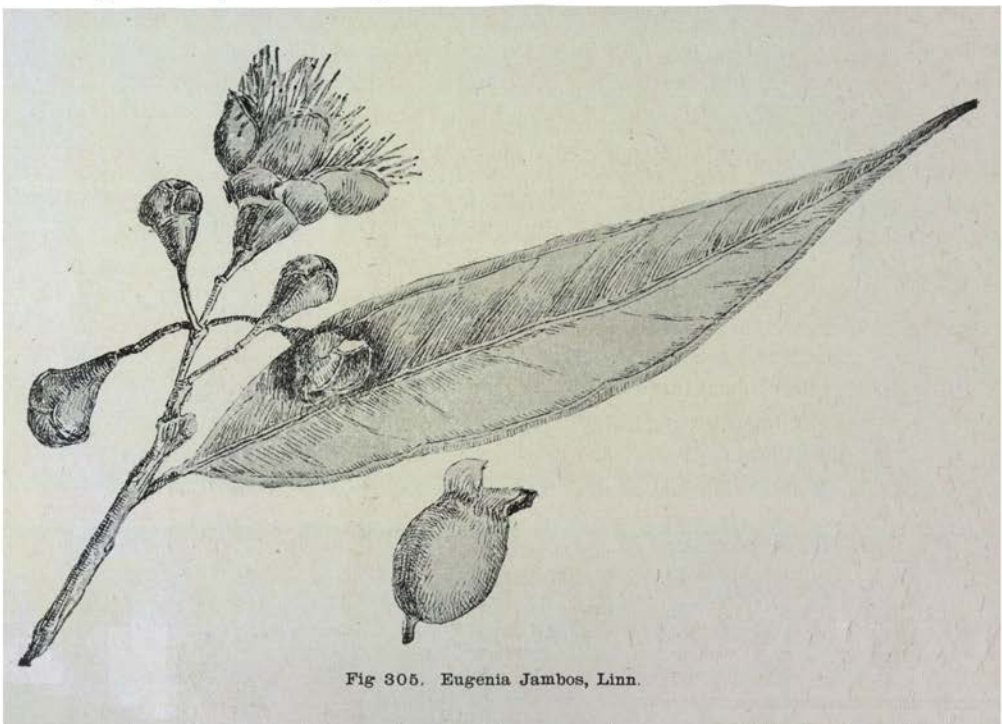

Fig 305. Eugenia Jambos, Linn.

A moderate-sized or small tree. Leaves coriaceous, 3·5″-8″ by ·75″-1·25″, glabrous, narrowly lanceolate, acuminate, gland-dotted; lateral-nerves united in a distinct intramarginal vein; petioles stout, channelled, ·25″ long. Flowers large, white, 2.5″ in diameter, in stout, terminal racemes, shorter than the leaves. Calyx-tube turbinate; lobes rounded with membranous margins. Petals white, closely glandular-dotted. Fruit subglobose, greenish-yellow, 1″-1·5″ in diameter, crowned with the 4 calyx-lobes and style; epicarp thick, fleshy, very sweetly scented, edible; seeds 1-2, large, plano-convex, loose in the epicarp when ripe; testa thin, rough, brown; cotyledons unequal, green.

Native country doubtful; planted throughout the presidency; run wild near

villages in North Kanara. Fl. Jan. to Mch. Fr. July Aug. also at other times during the year. Bark smooth. "Wood brown, rather soft with wavy concentric lines of loose texture. Pores small or moderate-sized, numerous, in oblique or radial lines. Medullary rays fine, numerous." Gamble. Fruit scented, edible but of poor quality.

3. E. hemispherica, Wight. Ill. 2, 14; Fl. Br. I. 2, 477; Bedd. Fl. Sylv. t. 203; Cooke Fl. Pres. Bomb. 1, 488; Gamble Ind. Timb. 356; *Jambosa lanceolaria,* Wgt.; Dalz. & Gibs. Bomb. Fl. 94.

Fig 306. Eugenia hemispherica, Wgt.

A large evergreen tree; branchlets subtetragonal. Leaves ovate-lanceolate, caudate-acuminate or sometimes obtuse at the apex, narrowed into the petiole

at the base, 7″-3″ by 2·25″-1·5″, coriaceous, minutely glandular-dotted; lateral-nerves about 12 pairs, looping within the margin, more or less conspicuous beneath; petioles ·25″-·5″ long, stout, channelled. Flowers white, fragrant, ·75″-1″ across, in short, terminal, panicled cymes, usually in 3s on the peduncles. Calyx-tube subhemispheric or obconical, rough; lobes broadly ovate with membranous margins, deflexed or spreading. Petals gland-dotted, large, concave, reflexed. Disk yellow, glandular, thickened. Fruit globose, ·75″-1″ in diameter, rough, crowned with the calyx-lobes; pedicels jointed.

Southern India and Ceylon. On the Konkan and North Kanara ghâts in rain and monsoon-forest, common on the Nilkund, Ram and Ainshi ghâts, and throughout the Siddapore taluka; often along river banks. Fl. Mch.-April. Fr. R. S.

A large or moderate-sized tree. Bark smooth, scaly; inner-bark red. Wood light-brown, hard. Pores small, numerous, single or in rows. Medullary rays fine, not distinct, crossed by fine wavy indistinct lines of light-coloured tissue. Weighs 46 lbs. to the cub. ft. Colonel Beddome is of opinion that *E. hemispherica,* Wgt., and *E. lanceolaria,* Roxb. are identical.

4. E. læta, Ham. in Trans. Wern. Soc. V, 338; Fl. Br. I. 2, 479; Cooke Fl. Pres. Bomb. 1, 488; Gamble Ind. Timb. 358; Brandis Ind. Trees, 318; *Jambosa pauciflora,* Wgt.; Dalz. & Gibs. Bomb. Fl. 94; *E. Wightii,* Bedd. Fl. Sylv. 109. *Kan-jamb*, H.

A small, evergreen tree. Leaves ovate or ovate-lanceolate, 5″-3″ by 2″-1·5″, more or less long acuminate, narrowed into a very short petiole at the base, glabrous, thinly coriaceous, glandular-dotted; lateral-nerves 12-15 pairs, united in a slender intramarginal vein, distinct beneath. Flowers large, crimson, 1·5″-2″ across, solitary or in 3-5-flowered, axillary or terminal cymes. Calyx-tube ·75″ long, nearly cylindrical, slightly widening upwards, and suddenly expanded into a 4-obtuse-lobed limb; lobes reflexed in the open flower, articulate with the pedicel, obscurely striate. Petals white, orbicular, ·5″-·7″ long, glandular and conspicuously veined. Disk thickened. Stamens very numerous, crimson, forming a tassel of filaments exceeding the petals. Style 1·5″ long, persistent. Fruit ovoid, 1″ in diameter, constricted into a narrow neck at the top and crowned with the broad, spreading calyx-lobes, dark-brown coloured.

Western peninsula from Bombay southwards. In rain-forest on the higher ghâts of North Kanara; common on the Gairsoppah ghât. Fl. C. S. Fr. H. and R. S.

A large shrub or small tree with very ornamental crimson tassel like flowers.

5. E. Wightiana, Wight. Ill. 2, 15; Ic. t. 529; Fl. Br. I. 2, 485; Brandis Ind. Trees 319; Gamble Ind. Timb. 356; *E. lanceolata,* Lamk.; Bedd. Fl. Sylv. 109; Cooke Fl. Pres. Bomb. 1, 489; Trimen Fl. Ceyl. 2, 172.

A small tree with slender, terete, smooth branches. Leaves elliptic-lanceolate, caudate-acuminate, 3″-5″ by 1·25″-1·5″, coriaceous, gland-dotted; lateral-nerves numerous, parallel, rather faint, united in an intra-marginal vein close to the edge; petioles very short. Flowers nearly sessile, in short, few-flowered, axillary cymes or on the leafless branches. Calyx-tube elongate, clavate. Petals white, about 12, usually calyptrate, broadly obovate. Fruit ellipsoid, about ·75″ long, tapering to a slender base, crowned with the calyx-lobes and persistent style, dark-brown coloured.

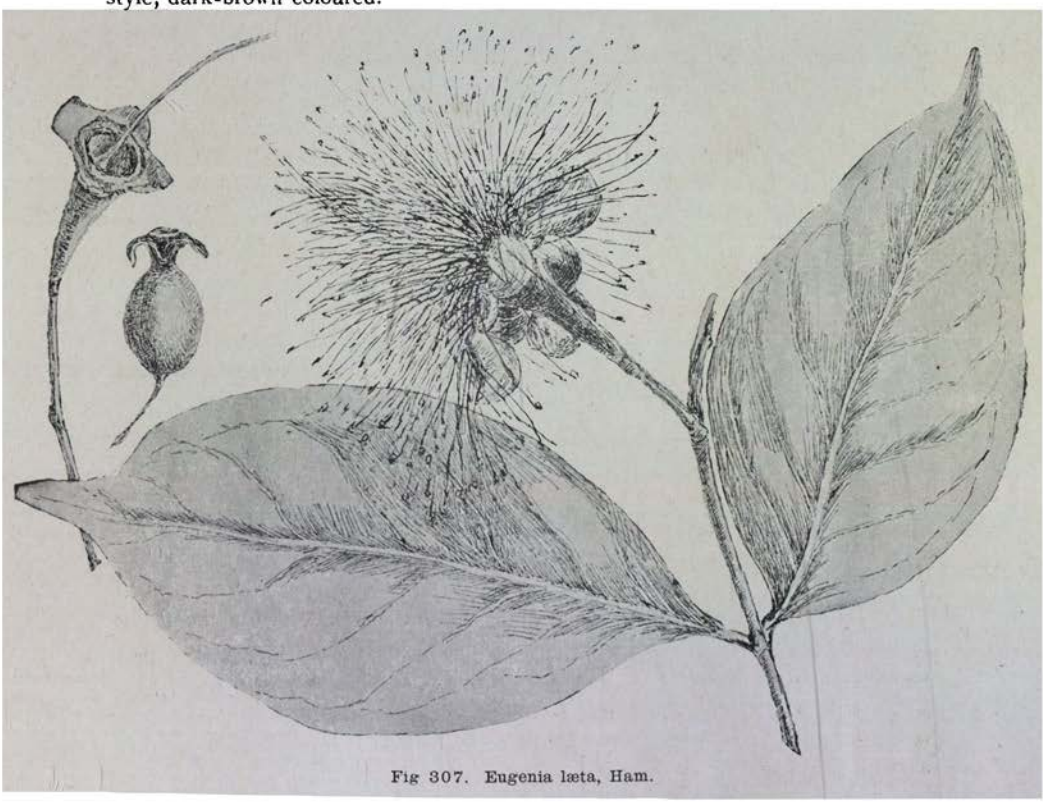

Fig 307. Eugenia læta, Ham.

Nilghiris and Dindigul mountains, Ceylon; Konkan, and N. Kanara, (Castle Rock) near rivers and along water courses, rare. Fl. Feb.-Mch.

6. E. zeylanica, Wgt. Ic. t. 73; Fl. Br. I. 2, 485; Gamble Ind. Timb. 356; Brandis Ind. Trees 321; *E. spicata,* Bedd. Fl. Sylv. t. 202; Cooke Fl. Pres. Bomb. 1, 490: *Syzygium zeylanicum,* DC.; Dalz. & Gibs. Bomb. Fl. 94. *Pitculi, bhedas,* M.; *Nerkal, hole-lucky,* K.

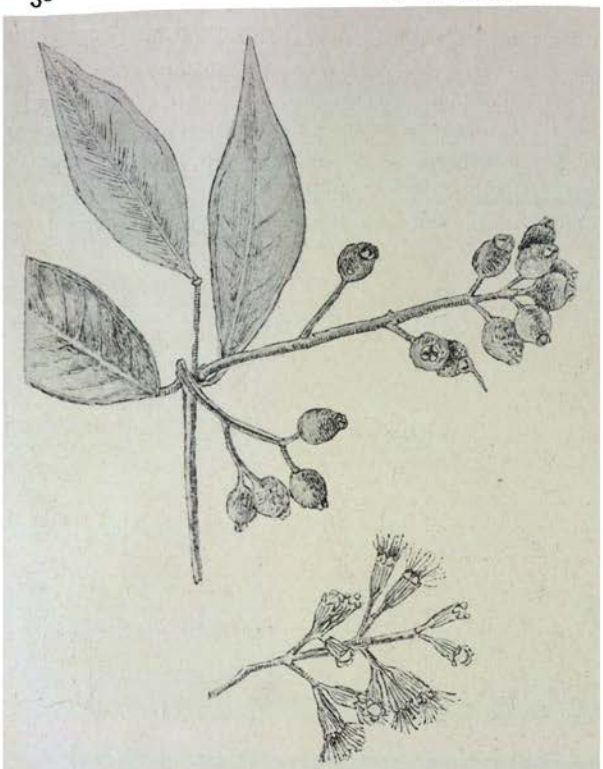

Fig 308. Eugenia zeylanica, Wight.

A small or middle sized tree; branchlets 4-angled or terete. Leaves coriaceous, 1·5″-3″ by ·5″-1·25″, lanceolate or ovate-lanceolate, smooth, shining above, paler and minutely gland-dotted beneath; margins often recurved; main lateral-nerves numerous, uniting within the margin in a distinct line; petioles ·2″ long. Flowers white, numerous, shortly pedicellate, in axillary and terminal paniculate cymes; bracteoles O. Calyx-tube tubercled, glandular, funnel-shaped 4-5·25″ long; lobes broadly ovate, erect, persistent. Petals 4-5, orbicular, free, early caducous. Fruit nearly globose, size of a pea, white, 1-seeded.

Western peninsula, Silhet, Malay peninsula to Singapore, also in the Andamans; throughout the Konkan and North Kanara ghâts along rivers and nalas, common in North Kanara. Fl. Feb.-Apl. Fr. R. S.

A moderate-sized handsome flowering tree. Bark scaly; inner-bark thick, red or brown. Wood grey, hard, close-grained; used for building purposes and agricultural implements.

7. E. rubicunda, Wgt. Ic. t. 538; Fl. Br. I. 2, 495; Cooke Fl. Pres. Bomb. 1, 490; Brandis Ind. Trees, 324; Bedd. Fl. Sylv. 108; *E. lissophylla*, Thw. Enum. 117 *(Syzygium)*; Fl. Br. I. 2, 488; Bedd. Fl. Sylv. 108; *Syzygium rubicundum*, W. & A.; Dalz. & Gibs. Bomb. Fl. 94.

A middle-sized tree; branchlets quadrangular. Leaves elliptic or elliptic-lanceolate, 1·5″-5″, by ·5-1·5, glabrous shining above, paler beneath; blade narrowed into a short petiole; lateral-nerves fine numerous, parallel, united in a

distinct intramarginal line. Flowers pinkish-white, nearly globose, ·25″ in diameter, sessile or very shortly pedicelled, in threes at the ends of the branchlets, arranged in terminal and axillary cymes longer than the leaves. Calyx-tube shortly turbinate, rugose on the outside; lobes very short, nearly obsolete. Petals calyptrate. Stamens longer than the calyx-tube. Fruit globose, size of a small pea, glabrous, black, crowned with the persistent calyx-lobes.

Western peninsula, Nilghiris, Ceylon, Konkan; Stocks. A rare species.

8. E. corymbosa, Lamk.; Trimen Fl. Ceyl. 2, 174; Cooke Fl. Pres. Bomb. 1, 491; Brandis Ind. Trees, 324; *E. caryophyllæa,* Wgt. Ic. t. 540; Fl. Br. I. 2, 490; Bedd. Fl. Sylv. 108; *Syzygium caryophyllæum,* Gærtn.; Dalz. & Gibs. Bomb. Fl. 93. *Ran-lavang, bhedas,* M.; *Kunti-neerl, bhelsee,* K.

Fig 309. Eugenia corymbosa, Lam.

A large shrub or small tree; branchlets terete or somewhat compressed, brown. Leaves obovate, obtuse or suddenly bluntly acuminate, narrowed into a short petiole, 2·5″-3·5″ by ·75″-1·75″, dark-green, shining above, pale and gland-dotted beneath, coriaceous; lateral-nerves numerous, parallel, joined by reticulate veins and distinctly looping within the margin. Flowers sessile, in terminal, compound, trichotomous cymes with quadrangular branches; buds globose. Calyx-tube broadly turbinate, ·12″ long with a nearly truncate limb rugose on the outside. Petals calyptrate. Fruit depressed-globose about ·4″ in diameter, purple-black, juicy with a thin, shining skin.

Western peninsula, South India and Ceylon; Mahableshwar (4500′) on the banks of streams; throughout the Konkan and North Kanara in moist forests, very common near the coast above high water mark, sometimes close to the

sea often on laterite in clumps associated with *Memecylon edule*, *Canthium parviflorum*, *Flacourtia sepiaria*, *Ixora coccinea*, etc. Fl. Mch.-May. Fr. R. S.

A small or moderate-sized bushy tree. Bark grey, smooth, scaly. Wood light-brown, smooth, soft. Pores small, uniformly distributed. Medullary rays fine, indistinct. Annual-rings not very clear. Weighs 54 lbs. to the cub. ft. Fruit edible.

Fig 310. Eugenia utilis, Talb.

9. E. utilis, Talb.; Jour. Bomb. Nat. Hist. Soc. XI, 235. t. 3; Trees Bomb. 169; Cooke Fl. Pres. Bomb. 1, 495; Brandis Ind. Trees, 324; *Hennerl*, K.

Fig 311. Eugenia kanarensis, Talb.

A large, quite glabrous, evergreen tree; branches terete. Leaves coriaceous, elliptic, abruptly and shortly acuminate, acute at the base, conspicuously gland-dotted; blade 3″-2″ by 1·5″-1″; petioles ·3″ long; lateral-nerves close, rather inconspicuous. Flowers small, in axillary or terminal, corymbose, panicled cymes, shorter than the leaves, sessile, usually fascicled in threes on the cyme branches; buds globose or pear-shaped, ·1″ in diameter. Calyx shortly turbinate, scarcely lobed or truncate. Petals separate or slightly cohering. Fruit small, black, succulent.

Fig 312. Eugenia kanarensis, Talb.—*Fruit.*

A fine tree with a straight, cylindrical trunk, and grey, scaly bark. Wood tough of a reddish-brown colour. Pores moderately-sized, sub-divided and in short rows. Medullary rays moderately-broad, indistinct. Weighs 42 lbs. to the cub. ft. Greatly in demand throughout the Sirsi Sub-division of North Kanara for building purposes. This tree is pretty common in or on the borders of rain-forest in the southern parts of North Kanara.

10. E. kanarensis, Talb.; Jour. Bomb. Nat. Hist. Soc. XI, 236. t. 4; Trees Bomb. 169; Gamble Ind. Timb. 362; *E. Gardneri,* Duthie in Fl. Br. I, 2, 489; Cooke Fl. Pres. Bomb. 1, 492.

A very large, glabrous, evergreen tree with smooth, white, terete branchlets. Leaves ovate, long or shortly acuminate, acute at the base, thin, shining, minutely gland-dotted; blade 2″-4″ by ·75″-1·5″; lateral-nerves numerous, fine, distinct, anastomosing just within the margin in a fine line; petioles ·5″ long. Flowers small, in open, spreading, axillary or terminal corymbose cymes, shorter than the leaves; cyme-branches slender. Buds small, ·09″ in diameter, globose. Calyx elongate, turbinate, broad at the top, narrowed at the base into a short pedicel, scarcely 4-5-lobed or truncate. Petals free or slightly cohering, orbicular. Fruit shortly pedicelled, size and shape of an olive, blue-black, pulpy, crowned with the calyx-tube, 1-seeded; episperm chartaceous; cotyledons hemispheric, green.

A smooth-barked tree, found in Travancore and on the Gairsoppah Ghât of N. Kanara above Mulamune in rain-forest at an elevation of about 2000′. Fruit of this species collected on the Devimone ghât at the end of Feb. appears to be distinct from that of *E. Gardneri.*

11. E. Stocksii, Duthie; Fl. Br. I. 2, 498; Cooke Fl. Pres. Bomb. 1, 491.

A large, lofty tree with acutely quadrangular branches. Leaves elliptic. obovate, 4″-6·5″ by 1·75″-3″, rounded or shortly acuminate, thin, glabrous, dots opaque, not pellucid; nervation obscure, towards the margin and not uniting in an intramarginal vein; petioles about ·5″ long. Flowers small, ·12″ across, in branched, axillary cymes; peduncles 1″-2″ long. Calyx funnel-shaped, rough on the outside; lobes 4, rounded or subacute. Petals calyptrate, gland-dotted. Fruit unknown.

Konkan, Stocks; Wynaad, Bedd. I am unacquainted with this rare species and give it on the authority of the Fl. Br. I. as having been found in the Konkan by Dr. Stocks and in Kanara by Dalzell.

12. E. Jambolana, Lam. Dict. III, 198; Fl. Br. I. 2, 499; Bedd. Fl. Sylv. t. 197; Brandis For. Fl. 233; Cooke Fl. Pres. Bomb. 1, 492; Gamble Ind. Timb. 361; *Syz. Jambolanum,* DC.; Dalz. & Gibs. Bomb. Fl. 93. *Black Plum. Jambul, jam, jaman,* M.; *Nerlu.* K.

A large or medium-sized, evergreen tree; branchlets cylindrical, compressed. Leaves coriaceous, variable in size, 2·5″-6″ by 1·25″-3″, elliptic, obovate-oblong, subobtuse or shortly acuminate, smooth, shining, coriaceous, pellucid-dotted, aromatic, bright green; lateral-nerves very numerous, and close, united in a distinct intramarginal vein; petioles ·25″-·5″ long. Flowers whitish, sweet-scented, sessile, in small heads at the ends of lax panicled cymes on the previous year's wood beneath the leaves, rarely axillary or terminal. Calyx-tube turbinate, yellow

within; rough outside, ·1″-·25″ long with a short, cylindrical base; limb cup-shaped, nearly truncate, obscurely 4-lobed. Petals calyptrate, not pointed at the top. Stamens as long as the calyx-tube. Fruit ovoid or globose, often somewhat curved, ·5″-1·5″ long, pink, turning black-purple when fully ripe, crowned with the calyx-lobes.

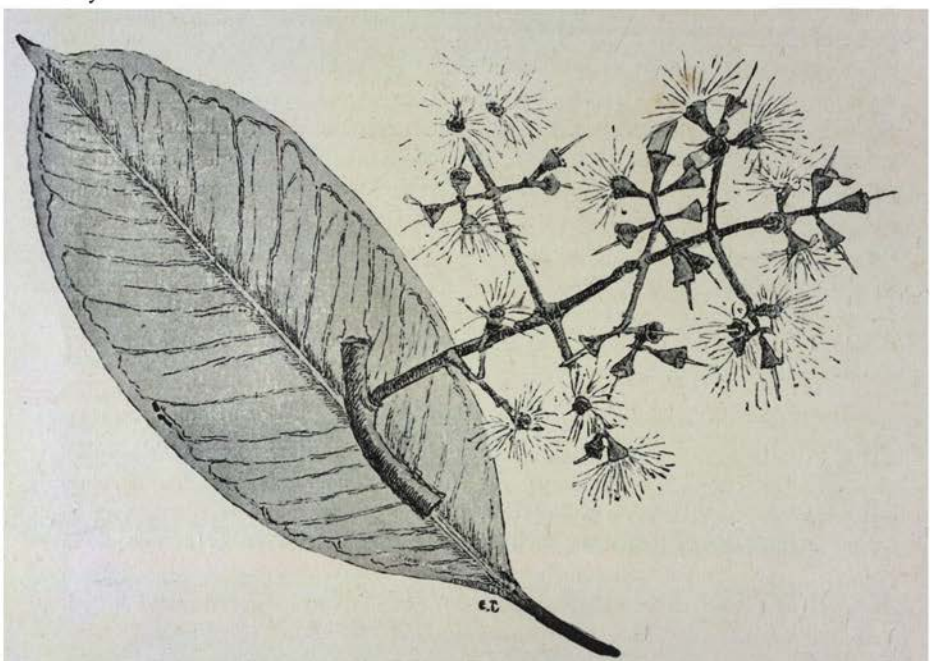

Fig 313. Eugenia Jambolana, Lam.

Throughout India, Burmah and Ceylon, from the plains up to 6000′ elevation, Malay archipelago to Australia; throughout the presidency both wild and cultivated; common along river banks and generally in moist localities; one of the principal constituents of the low elfin-wood on the Mahableshwar laterite; in the Khandesh Akrani and on the highest hills of Nasik and Satara districts; often cultivated along roadsides as a shade-tree. Fl. Mch. May. Fr. May-Aug.

A large or medium-sized tree with a usually more or less crooked and gnarled trunk up to 80′ high and 4′ in diameter. On the Mahableshwar plateau in stunted evergreen forest *Jambul* has a very short and thick trunk up to 7′ in diameter; long serpentine horizontal branches and low flat crown. Bark ·5″-1″ thick, smooth, grey, exfoliating in thick irregular scales; inner-bark dark-brown

usually hard and fibrous. Wood reddish-grey, moderately hard, darker near the centre but with no distinct heart-wood. Pores moderate-sized and small, numerous, elongated and frequently subdivided. Medullary rays fine, numerous, crossed by faint concentric bands of soft tissue. Annual-rings often marked by a line containing few or no pores. Weighs about 45 lbs. to the cub. ft. Gives a fairly durable timber used for posts, beams and general building purposes agricultural implements, carts etc. also in the construction of steps and curbs of wells. Boats and canoes are made from it. Yields an excellent fuel. The bark is used in tanning and dyeing and in medicine as a specific for dysentery. and the seeds may it is stated prove of use in cases of Diabetes. The slightly astringent fruit which is sometimes as large as a pigeon's egg is eaten by all classes of natives; it has a somewhat harsh and sweetish flavour. A kind of vinegar used in disease of the spleen is extracted from it. The *Jambul* is sacred both to the Hindus and Buddists and is often found near temples dedicated to Krishna. Easily reproduced from seed, somewhat extensively planted by the Forest Department on the Satara and Nasik ghâts. In the moist forests of N. Kanara during the period of heavy rainfall in Aug. or Sept. the tree sometimes suddenly or within a very short period becomes nearly or almost quite, defoliated.

13. E. Heyneana, Wall. Cat. 3, 599 *(Syzygium)*; Fl. Br. I. 2, 500; Cooke Fl. Pres. Bomb. 1, 393; Gamble Ind. Timb. 362; *Syz. salicifolium,* Dalz. & Gibs. Bomb. Fl. 94 (not of Wall.); *E. salicifolia,* Grah.; Bedd. Fl. Sylv. 109; Wgt. Ic. t. 539. *Parnera,* Hind.; *Par* or *pan-jambul, bedas,* M.

A large shrub or small tree, usually gregarious in river beds. Leaves lanceolate, or oblong-lanceolate, thinly coriaceous, sub-obtuse, or acute, 2″-4″ by ·5″-1·2,″ pellucid-dotted, gradually narrowed into the petiole at the base; lateral-nerves numerous, fine uniting in an intramarginal vein; petioles ·1″-·4″ long. Flowers white, sessile, in small, loose heads, arranged in compound, trichotomous cymes on the old wood beneath the leaves, rarely axillary. Calyx funnel-shaped, somewhat rugose on the outside, ·2″ long; lobes 4, very short or the limb nearly truncate. Petals short calyptrate; cap rounded at the apex. Fruit oblong, ·5″ long, often curved, crowned with the long and broad calyx-tube, pink, not edible.

Western peninsula, Berars and the Central Provinces. In the beds of streams and rivers; sometimes submerged for considerable periods during the rainy season; common throughout the Deccan, Konkan and North Kanara. Fl. Mch.-Apl. Fr. ripe June.

A small tree, sometimes only a large shrub. Bark white. Wood reddish, strong, similar to that of *E. Jambolana* but pores smaller.

14. E. macrosepala, Duthie. Fl. Br. I. 2, 501; Cooke Fl. Pres. Bomb. 1, 493; Brandis Ind. Trees, 325.

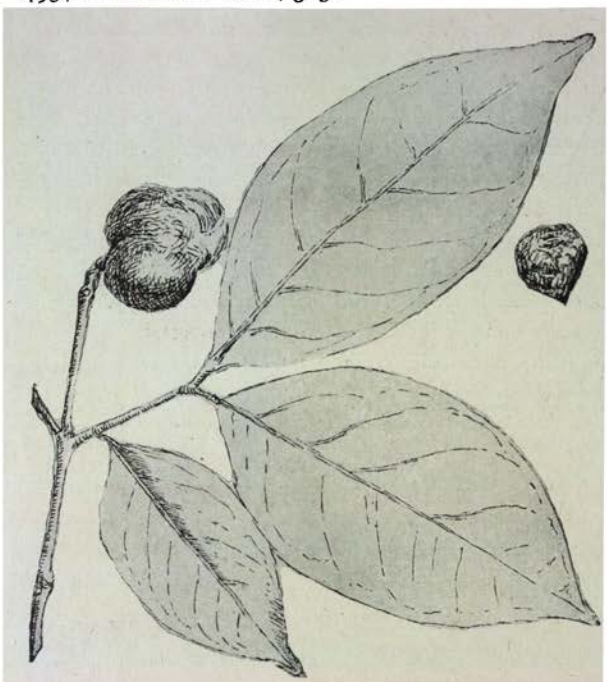

Fig 314. Eugenia macrosepala, Duthie.

A large shrub or small tree, often gregarious in rain-forest; branchlets terete, grey-pubescent. Leaves elliptic-oblong or oblong-lanceolate, sometimes shortly acuminate, narrowed into a short petiole at the base, 2″-5″ by ·75″-1·75″, thin, pubescent when young, afterwards glabrous; lateral-nerves 8-12 pairs, more or less conspicuous beneath, looping within the margin; petioles about ·25″ long, pubescent. Flowers white, sweet-scented, sessile, axillary or from the leafless axils, 2-4-fascicled; bracteoles linear, pilose, equalling or shorter than the calyx-lobes. Calyx 4-lobed; tube very short; lobes spreading, lanceolate, ·4″ long pubescent and ciliate on the margins. Disk ·2″ in diameter, nearly circular, filling the calyx-tube and papillose on the slightly rounded apex. Petals white, broadly ovate, acute, shorter than the calyx-lobes, ciliate on the margins. Fruit very irregularly globose, ·75″ in diameter, pubescent, gland-dotted, crowned with the calyx-lobes; seeds 2-3, irregularly obtusely angled, about ·4″ in diameter, glabrous, smooth, mottled. Locally abundant on the North Kanara ghâts, apparently endemic; sometimes a shrub; common as a small gregarious tree on the Dodmune ghât. Fl. Jan.-Apl. Fr. R. & C. S.

15. E. Mooniana, Wgt. Ic. t. 551; Fl. Br. I. 2, 505; Cooke Fl. Pres. Bomb. 1, 494; Brandis Ind. Trees, 325; var. *gracilis;* Bedd. Fl. Sylv. 110.

An erect or prostrate, evergreen, glabrous, usually small shrub. Leaves ovate, elliptic-lanceolate, 1·25″-3·25″ by ·4″-1·25″, subobtuse or shortly acuminate, narrowed into a short petiole at the base, thin, coriaceous, bright-green above

paler beneath; lateral-nerves very fine and slender, inconspicuous; petioles 0-·12" long. Flowers ·25" across, white, solitary or 2-4-fascicled on the old wood, axil-

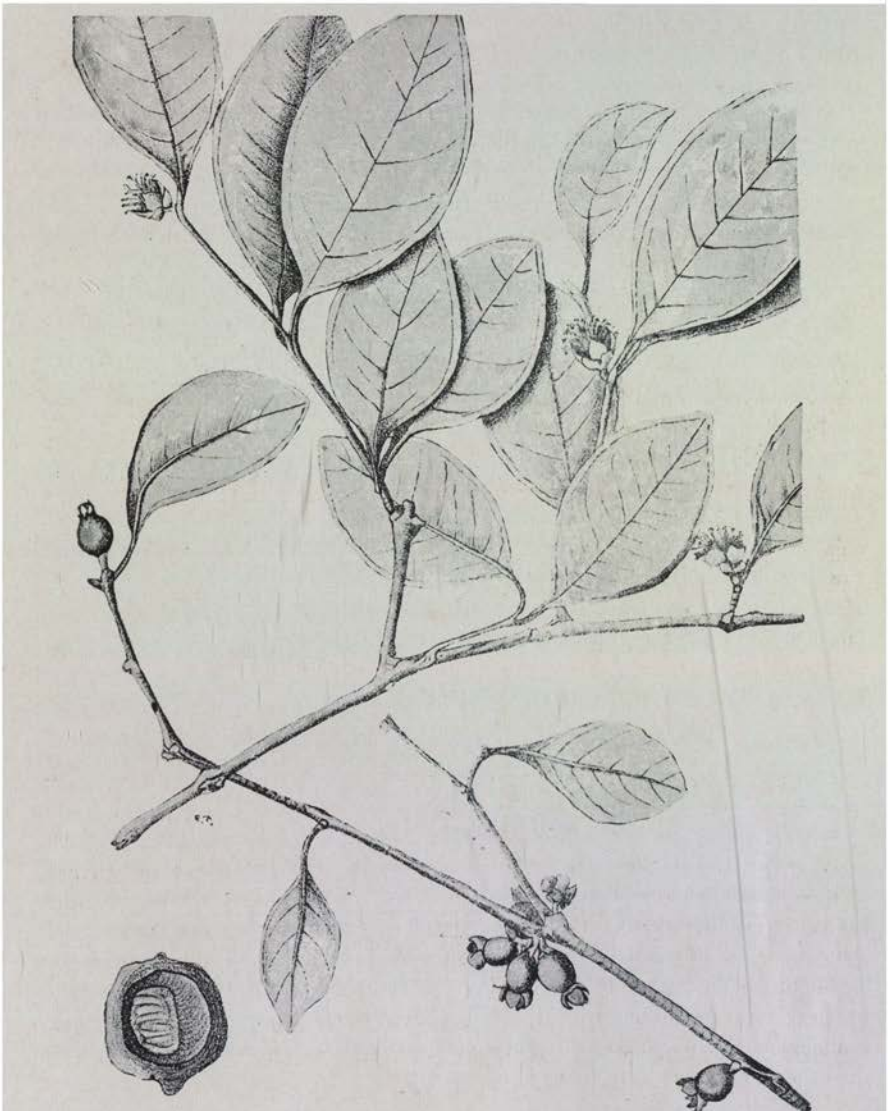

Fig 315. Eugenia memecylifolia, Talb.

lary or sometimes terminal; bracteoles small, subulate, clothed with white hairs; pedicels filiform, hairy, ·5″ long. Calyx ·1″ long; tube about one half the length of the calyx, rough outside, funnel-shaped; lobes 4, obtuse or acute, divided by a rather broad sinus. Petals longer than the calyx-lobes, ovate, glandular. Fruit globose, size of a large pea, red-coloured, succulent, gland-dotted.

Nilghiris, Sivaghiris, Konkan and Ceylon; evergreen forests of the Konkan and North Kanara, common on the sea-coast near Karwar. Fl. Feb.-Mch. Fr. Aug.-Jany.

Dalz. & Gibs. Bomb. Fl. 94 mention a tree from the Phoonda ghât *E. Wildenovii*, DC., which may be *E. uniflora*, Linn., a cultivated species native of S. America.

16. E. memecylifolia, Talb. Jour. Nat. Hist. Soc. Bomb. XI. 236, t. 5; Trees Bomb. 170; Brandis Ind. Trees, 326; *E. codyensis*, Munro; Cooke Fl. Pres. Bomb. 1, 494.

A small evergreen tree. Leaves ovate, bluntly acuminate, coriaceous, glandular-dotted, shortly petioled; blade 1·5″-2″ by 1″-1·5″; petioles ·2″-·5″ long. Flowers white, sessile or subsessile, ·5″ across, solitary or 2-several fascicled in the leaf-axils. Bracts 2, broad-ovate, small, thick leathery, tomentose when young. Calyx-lobes 4, ovate, imbricate, tomentose, ciliate on the margins, glandular-dotted. Petals 4, spreading. Staminal-disk broad, enlarged. Style simple. Fruit white, succulent, irregularly-globose, ·75″-1″ in diameter. Seeds 1-2, globose, flattened on one side, ·5″ in diameter, glabrous; episperm crustaceous, mottled. In quite ripe fruits the seeds lie loose in the swollen, succulent, white pericarp.

A small tree or large shrub with smooth bark, gregarious in the sholas of the higher Supa ghâts of North Kanara at an elevation of about 3400′. This species is closely allied to *E. codyensis*, Munro, a shrub found in Kurg and the Nilghiris.

3. BARRINGTONIA, Forst.

Trees. Leaves alternate, crowded towards the ends of the branches not gland-dotted. Flowers bracteate, in elongated, interrupted spikes or racemes; bracteoles minute or O. Calyx-tube ovoid or turbinate; lobes 2-4, rarely 5. Petals 4 or rarely 5, imbricate, adnate to the base of the staminal-tube. Stamens indefinite, connate at the base into a ring. Disk annular. Ovary inferior. Berry fibrous, fleshy, crowned with the calyx-limb, usually 1-seeded; seed ovoid, exalbuminous; embryo consisting of 2 concentric masses, one a woody rind and the other a medulla; cotyledons obsolete.

Calyx-lobes valvate. Fruit ovoid, 2″ long ... ... 1. B. racemosa.
Calyx-lobes imbricate. Fruit quadrangular, 1″ long. 2. B. acutangula.

1. B. racemosa, Bl. in DC. Prodr. III, 288; Fl. Br. I. 2, 507; Dalz. & Gibs. Bomb. Fl. 94; Cooke Fl. Pres. Bomb. 1, 496; Gamble Ind. Timb. 363. *Nivar*, M.

A small or middle-sized tree with drooping branches covered with large, prominent leaf-scars. Leaves crowded at the ends of the branches, obovate-oblong, membranous, 4″-12″ by 2″-5″, acute at the apex, narrowed into the very short petiole at the base, glabrous and shining on both sides, finely crenate-serrate; lateral-nerves about 15 pairs, curved upwards and prominent beneath. Flowers large, about 2″ in diameter, yellowish-white, in slender, distant-flowered, terminal or axillary racemes, 12″-24″ long; buds globose; pedicels ·25″ long, stout; bracteoles minute, early caducous. Calyx-tube turbinate, glabrous; limb splitting somewhat irregularly into 2-3, unequal-lobes, quite closed in bud, ·3″-·5″ long. Petals 4, ovate or ovate-oblong, about 1″ long, connate at the base, spreading. Stamens more than 1″ long, numerous; filaments erect, spreading, often crimson-coloured. Style 1·5″-2″ long. Fruit smooth, ovoid, 2·5″ long, crowned with the persistent calyx-lobes; pericarp leathery; seed solitary, 1·25″-2·5″ long.

Western coast, Sundarbans, Andaman Islands and Ceylon; along rivers and nalas near the coast of the Konkan and North Kanara. Fl. H. S. Fr. R. S.

Bark smooth. Wood white, soft, porous. Pores small and moderate-sized. Medullary rays moderately broad, crossed by transverse bars. Weighs 27 lbs. to the cub. ft. Planted in and about Colombo for ornament.

2. B. acutangula, Gærtn. Fruct. II, 97. t. 101; Fl. Br. I. 2, 508; Brandis For. Fl. 235; Dalz. & Gibs. Bomb. Fl. 95; Bedd. Fl. Sylv. t. 204; Cooke Fl. Pres. Bomb. 1, 496; Gamble Ind. Timb. 363. *Indian Oak; Tivar, piwar, ingli, datte-phal*, M.; *Hole-kauva, mavin-kubia*, K.

A middle-sized or small tree; branchlets slender, glabrous. Leaves obovate, or obovate-lanceolate, 2″-5″ by 1″-3″, rounded or subacute at the apex, narrowed into a very short petiole at the base, minutely denticulate or crenulate, thinly coriaceous, dark-green above, paler beneath; lateral-nerves about 10 pairs, rather strong beneath; petioles ·2″ long. Flowers sweet-scented, red, ·3″ across, in slender long pendulous, many-flowered racemes; pedicels about ·15″ long; bracteoles linear-lanceolate, caducous. Calyx-lobes 4, slightly imbricate, not closed in bud, rounded, ciliate on the margins ·2″ long; tube as long as the lobes, puberulous outside. Petals rounded, glabrous, ·2″ long. Stamens ·75″ long. Fruit oblong, ovoid, bluntly quadrangular, 1″ by ·5″, narrowed at the base, truncate at both ends, crowned by the small, persistent calyx.

Throughout India from the Himalayas to Ceylon, very common in Bengal, always found in swampy places; banks of rivers and streams in North Kanara and the Konkan, common near the coast but not in *Mangrove* swamps. Fl. Apl.-May. Fr. Sept.-Oct.

A moderate-sized evergreen tree with conspicuous long pendant racemes of pink flowers. Bark dark-coloured, rough. Wood white shining, moderately hard, beautifully mottled on a cross section. Pores small, uniform, often in short, radial lines. Medullary rays broad or moderately broad, closely packed, crossed by fine bars of light-coloured, tissue. Concentric-rings of dark and lighter-coloured tissue alternate, probably marking the annual growth. Weighs 40 lbs. to the cub. ft. Used for boat-building, well-work, carts, &c., would make good furniture, turns black when buried in the mud. Bark used to intoxicate fish, very rich in tannin. Leaves and fruit used in native medicine.

4. CAREYA, Roxb.

Trees or shrubs. Leaves alternate, simple, crowded towards the ends of the branches, not glandular-dotted. Flowers large, showy, tetramerous, in racemes or interrupted spikes. Calyx adnate to the ovary and not produced beyond it; limb 4-divided. Petals 4-5. Stamens numerous, free, in several circles, united at the base into a thick ring. Ovary inferior, 4-5-celled; ovules numerous, attached to axile placentas; style elongate with a capitate or 4-lobed stigma. Fruit globose, fleshy, crowned with the calyx-limb, many-seeded. Seeds in fleshy pulp; cotyledons O.

C. arborea, Roxb. Fl. Ind. II, 638; Fl. Br. I. 2, 511; Brandis For. Fl. 236; Dalz. & Gibs. Bomb. Fl. 95; Bedd. Fl. Sylv. 205; Cooke Fl. Pres. Bomb. 1, 497; Gamble Ind. Timb. 364. *Kaval*, K.; *Kumbia*, *kuba*, M.

A large or middle-sized, glabrous, deciduous tree. Leaves usually sessile broadly obovate, rounded or shortly acuminate, 6″-12″ by 3″-7″, narrowed at the base, glabrous, crenate-denticulate, thick, smooth, and shining on both sides; lateral-nerves 10-12 pairs, spreading, prominent; petioles 0-·5″ long, narrowly winged. Flowers sessile, large, white and pink, with an unpleasant odour, a few together crowded at the ends of the branches, each with a central elliptical and 2 lateral linear bracts. Calyx about 1″ long; tube campanulate, glabrous; lobes rounded, shorter than the tube, stiff, erect. Petals 2″-2·5″ long, ovate, obtuse or subacute. Stamens about as long as the petals, spreading, pink-coloured. Style longer than the stamens. Fruit nearly globose, 2·5″-3″ in diameter, green, glabrous, crowned with the persistent calyx-lobes and style; seeds several, immersed in fleshy pulp.

Sub-Himalayan tract from the Jumna eastwards, Bengal, Burmah, Central, Western and Southern India, Ceylon up to 5000′ in exposed '*Patana*' land. Very common throughout the presidency in monsoon-forest also in valleys and ravines throughout the dryer areas. Fl. March-Apl. Fr. ripe July.

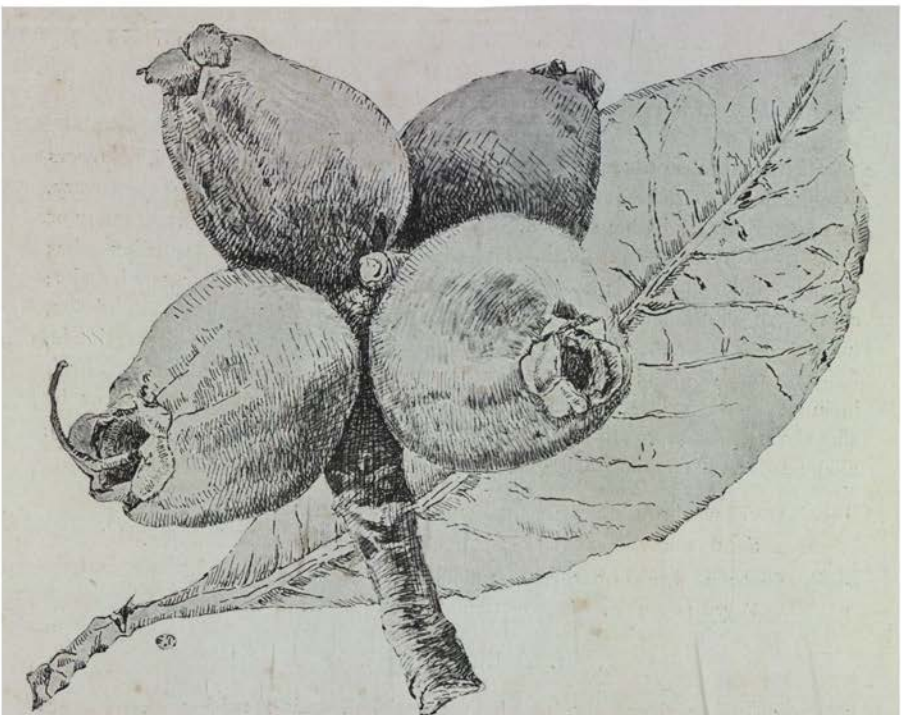

Fig 316. Careya arborea, Roxb.

A large deciduous tree. Leaves turn red in the cold season. Bark rough, dark-coloured with vertical and diagonal splits; inner-bark red, fibrous. Sap-wood large, white; heartwood dull-red, dark-coloured in old trees, even-grained, smooth and mottled. Pores small or moderate-sized, oval, sub-divided, few. Medullary rays fine, numerous, short, wavy, crossed by very fine and numerous inconspicuous bars. Weighs about 50 lbs. to the cub. ft. A very good, durable, easily seasoned timber which stands well under water, is little used except for agricultural implements. Bark yields a coarse strong fibre suitable for ropes and cordage; it also serves in native medicine as an astringent.

Order XLIII.—MELASTOMACEÆ.

Herbs, shrubs or trees. Leaves opposite, entire, often 3-7-nerved. Flowers regular, hermaphrodite. Calyx-tube united by vertical septa to the ovary, rarely nearly free; limb 4-6-lobed. Petals 3-6, imbricate. Stamens as many or twice as many as the petals, inserted with them on the edge of the calyx-tube; filaments inflexed in bud; anthers opening by 1-2 terminal pores, rarely by slits; connective often much enlarged and appendaged near the base by bristles, tubercles or a spur. Ovary wholly or half-inferior, 4-5-celled; style simple, filiform, rarely short; ovules several, rarely only 2 to each placenta. Fruit included in the calyx-tube, capsular or berried, breaking up irregularly or by slits through the top of the cells. Seeds minute, many (in *Memecylon* only 1); albumen O; cotyledons small (larger and much folded in *Memecylon*).

A villous shrub. Stamens unequal, dimorphous.
Seeds many. Leaves 2-7-palmately-nerved... 1. Melastoma.

Glabrous shrubs or trees. Stamens equal, similar.
Berry 1-seeded. Leaves pinnate-nerved. ... 2. Memecylon.

1. MELASTOMA, L.

Strigose or villous shrubs. Leaves petioled, entire, 3-7-nerved. Flowers terminal, showy, purple, 5-merous. Calyx clothed with bristles; tube bell-shaped; lobes 5. Petals usually 5. Stamens twice as many as the calyx-lobes; anthers opening by a single apical pore, very unequal, 5 larger with the connective produced below in a long appendage, and 5 smaller with the basal appendage shorter or wanting. Ovary 5-7-celled, more or less united to the calyx-tube, apex bristly; style simple filiform. Fruit bursting irregularly. Seeds minute, very many, minutely punctate; albumen O.

M. malabathricum, L.; DC. Prodr. III, 145; Fl. Br. I. 2, 523; Dalz. & Gibs. Bomb. Fl. 92; Trimen Fl. Ceyl. 2, 199; Cooke Fl. Pres. Bomb. 1, 500; Gamble Ind. Timb. 366. *Indian Rhododendron; Palore,* M; *Ankerki, liakeri,* K.; *Nankeri,* Kon.

A large evergreen shrub or small tree; branchlets, petioles, nerves on the underside of leaves, fruit etc. densely clothed with yellowish-brown, acute or acuminate, paleaceous scales, often serrulate on the margins; branchlets ultimately clothed with scaly fibrillose bark. Leaves ovate-lanceolate or oblong-lanceolate, acute at both ends, 1″-4″ by ·5″-2″, strigose above, hispid on the

venation beneath with soft, yellowish hairs between the nerves, spinous-denticulate on the margins, strongly 3-5-basal-nerved; the outermost nerves finer and close to the margin; petioles ·2″-·6″ long. Flowers large, purple, 2″-3″ across, in few-flowered, terminal, paniculate cymes; bracts ·25″-·6″ long, lanceolate, shortly stalked, covered with scaly hairs, 3-nerved. Calyx-tube broadly campanulate, about ·4″ long, covered with silvery, lanceolate scaly hairs; lobes variable, usually about as long as the tube, caducous, acute, spreading, glabrous within. Petals rounded, truncate, narrowed to the base, ·75″-1″ long. Stamens with yellow filaments; anthers alternately yellow and red; connectives of the longer curving over the shorter ones. Ovary bristly-hairy at the top; style about 1″ long, exceeding the stamens. Fruit globose, ·5″ in diameter, red, strigose outside; when ripe the pericarp breaks off in a ring near the base exposing the numerous minute, white, curved seeds imbedded on the surface of the 5, succulent, black placentas which are left seated on a red, saucer-like base.

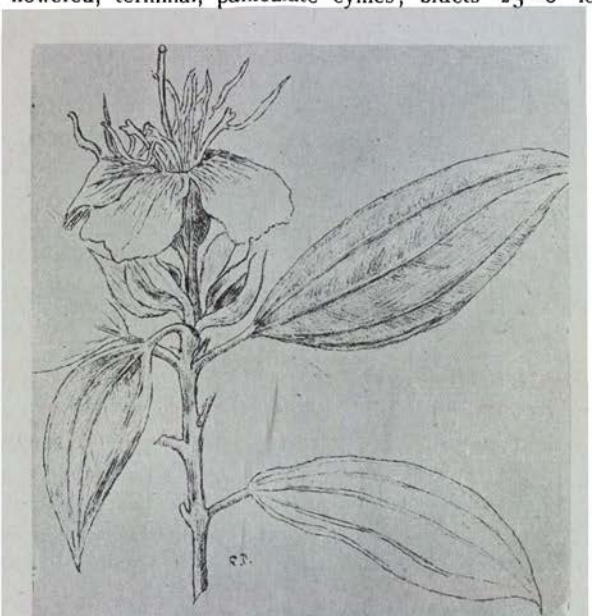

Fig 317. Melastoma malabathricum, Linn.

Throughout India from the sea-level up to 6000′ altitude; throughout the Konkan and North Kanara in moist forests, often along the banks of nalas near evergreen forests. Fl. and Fr. throughout the year. A handsome shrub with ornamental flowers and foliage.

2. MEMECYLON, L.

Evergreen shrubs or trees, quite glabrous; branchlets terete or winged. Leaves coriaceous, entire, short-petioled. Flowers usually small, in axillary cymes, clusters or umbellets. Calyx-tube campanulate; limb dilated, truncate

or shortly 4-lobed. Petals 4, blue or white, rarely reddish. Stamens 8, equal; anthers opening by slits in front; connective ending in a horn behind. Ovary inferior, 1-celled; apex glabrous, surmounted by a convex or depressed disk with 8 radiating grooves; ovules 6-12, whorled on a free central placenta; style filiform; stigma punctiform. Berry globose, crowned with the calyx-margin, 1-seeded. Seed large; cotyledons convolute or variously folded.

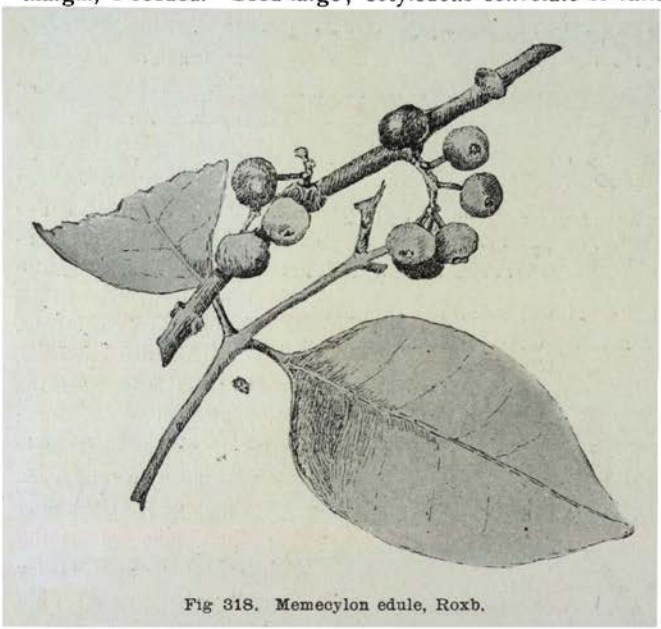

Fig 318. Memecylon edule, Roxb.

The genus *Memecylon* is generally considered one of the least easy of those described in the Flora of British India and the correct limitations of the variable species is attended with many difficulties. It is often doubtful whether one is dealing with true species or only mere varieties. For example the North Kanara plant with acutely quadrangular branchlets was considered at Kew to be probably *M. Wightii*, Thw. and was declared to be certainly not *M. malabaricum*, Cogn. Brandis to whom special specimens were submitted thought it was true *M. Wightii*, Dr. Cooke quotes the number of my sheet of *M. Wightii*, referred to under the description of *M. malabaricum*, in his Flora of the Presidency of Bombay. Finally Trimen in the Flora of Ceylon where the genus is largely represented, considers *M. malabaricum*, as a variety of Thwaite's *M. Wightii*, with which opinion I am disposed to agree as the terete or quadrangular nature of the branchlets is certainly a variable and not a constant specific character. Another example of the obscure relationships between the members of this genus is that C. B. Clarke for want of a better arrangement provisionally grouped 12 varieties or probable species under *M. edule*, Roxb. in the Flora of British India.

Peduncles axillary or on old wood.
Leaves petiolate, attenuate at the base.
Flowers pedicelled, in pedunculate cymes.
Fruit black ... ... 1. M. edule.
Flowers sessile, in compact, sessile heads.
Fruit yellow... ... ... 2. M. Talbotianum.
Leaves sessile or nearly so; base cordate or rounded.
Branchlets terete ... ... 3. M. malabaricum.
Branchlets acutely quadrangular or almost winged ... ... 4. M. Wightii.
Peduncles terminal ... ... 5. M. terminale.

1. M. edule, Roxb. Cor. Pl. t. 82; Fl. Br. I. 2, 563; Dalz. & Gibs. Bomb. Fl. 93; Gamble Ind. Timb. 368; Bedd. Fl. Sylv. 113; *M. umbellatum,* Burm; Cooke Fl. Pres. Bomb. 1, 503. *Iron-wood Tree. Angun, anguni, kurpa,* Vern. *Harchari, archeti, lakhonde,* K.

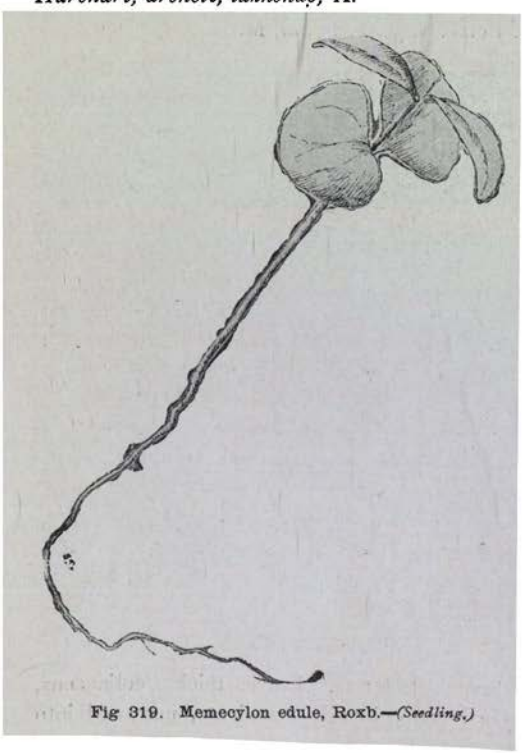

Fig 319. Memecylon edule, Roxb.—*(Seedling.)*

♀|A small tree; branchlets terete. Leaves ovate, subacute, obtuse, or bluntly acuminate, sometimes emarginate at the apex, acute at the base, 1·5″-3·5″ by ·75″-2·75″, coriaceous, dark-green, shining above, pale or light-green beneath; lateral-nerves indistinct; petioles ·25″-·4″ long. Flowers pedicelled, in short-peduncled, corymbose, many-flowered compact cymes, forming reddish-blue masses of inflorescence on the second year's wood beneath leafy branchlets; peduncles stout, flattened and grooved or slender, single or fascicled, ·25″-·75″ long; cyme-branches often as long as the peduncles; pedicels white, ·1″ long with minute caducous bracteoles at the base. Calyx-tube turbinate, minutely 4-lobed or truncate;

Disk reddish, veined. Petals minute, blue. Stamens with blue filaments; anthers with a black gland on the upperside of the connective horn. Pollen white. Fruit globose, size of a large pea, black, succulent, crowned with the quadrangular calyx-limb, 1-2-seeded.

I have ventured to retain the well established name *M. edule*, Roxb. Cor. Pl. t. 82 (1795) for this variable species as it is open to doubt whether *M. umbellatum*, Burm. f.; Fl. Ind. 87 published in 1768 is not distinct.

E., W. and S. India, Ceylon, Tenasserim and the Andamans; very common in the Konkan and North Kanara in moist evergreen forests and on laterite in bushwood scrub near the coast also on the higher Konkan ghâts, particularly abundant at Mahableshwar and Matheran. Fl. C. S. Fr. Apl. May. A small tree or large shrub. Wood light-brown, hard, close-grained, durable, difficult to work, resembles boxwood; similar in structure to that of *M. Wightii*, and weighs about the same; made into combs; used for building purposes house-posts &c.; yields excellent fuel and charcoal.

2. M. Talbotianum, Brandis in Talb. Trees Bomb. 1902, (Appendix); Brandis Ind. Trees, 336; Cooke Fl. Pres. Bomb. 1, 504. *Anguni*, M.

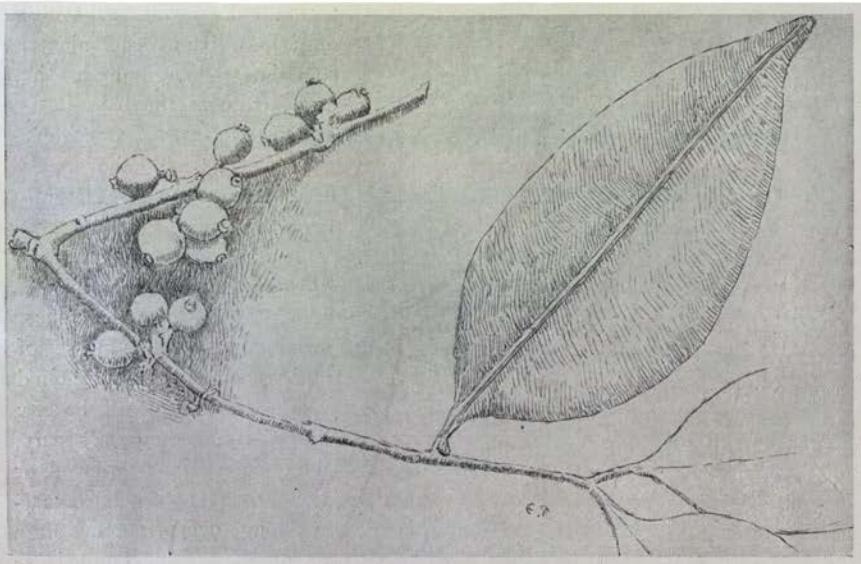

Fig 320. Memecylon Talbotianum, Brandis.

A large shrub or small tree; branchlets terete. Leaves thickly coriaceous, ovate or elliptic, 2″-4″ by 1″-2″, shortly and obtusely acuminate, narrowed into

a short petiole at the base, dark-green shining above, paler beneath, drying pale yellowish-green; margins slightly revolute; lateral-nerves indistinct; midrib prominent; petioles stout, channelled, about ·25″ long. Flowers small, blue, sessile, in compact clusters, axillary or on the old wood, on bracteate, very short, fascicled or simple peduncles ·1-·25″ long. Calyx-tube campanulate, ·1″ across; limb 4-lobed. Disk lining the calyx-tube, quadrangular, greenish. Fruit globose or ovoid, ·3″ in diameter, yellow, crowned with the calyx-tube, minutely rugose; cotyledons green, crumpled.

Ghâts of the W. peninsula from Bombay southwards, Nilghiris; Konkan (Lanoula and Khandala); Mahableshwar on laterite; N. Kanara, common in rain-forest near Yellapore. Fl. C. S. Fr. H. & R. S.

Separated by Brandis from *M. edule,* Roxb. of which it has hitherto been considered a variety. The yellow fruit is characteristic.

3. M. malabaricum, Cogniaux in DC. Monogr. Phan. 7, 1148 (not of Kostel); Brandis in Talb. Trees Bomb. 1902. (Appendix); Cooke Fl. Pres. Bomb. 1, 503; Brandis Ind. Trees, 337; *M. amplexicaule,* Roxb. Fl. Ind. 2, 260; var. *malabarica,* C.B.C. in Wight. Ic. t. 279; Fl. Br. I. 2, 559; *M. depressum,* Benth. *Limba,* M.; *Locundi, limbtoli,* K.

A small tree; branchlets terete. Leaves 3″-5″ by 1″-2·5″, ovate or oblong-lanceolate from a broad, cordate, often amplexicaul base, acute or subobtuse, coriaceous, shining above; lateral-nerves indistinct. Flowers on slender pedicels, in many-flowered fascicled umbels usually on the old wood; peduncles short; pedicels bracteolate, ·1″-·2″ long. Calyx-tube campanulate; limb saucer-shaped, subtruncate. Petals rounded, blue. Anthers much shorter than the connectives. Fruit black, size of a pea, crowned with the calyx-limb.

Nilghiris, mountains of Coorg, etc. In the rain-forests of North Kanara on the Yellapur ghâts. Fl. C. S. Fr. H. S. A rare species in the Bombay presidency.

4. M. Wightii, Thw. Enum. 113; Fl. Br. I. 2, 554; Cooke Fl. Pres. Bomb. 1, 503; Brandis Ind. Trees, 337.

A small tree; branchlets sharply quadrangular, or almost narrowly winged. Leaves ovate or elliptic-lanceolate, 6″-2″ by 2″-1″, acute or shortly acuminate, cordate at the base, thick, coriaceous, shining above; lateral-nerves obscure; petioles very short, ·1″ long. Flowers blue, in globose clusters on the old wood below the leafy branchlets; peduncles 0; pedicels slender, ·15″ long. Calyx-tube campanulate; limb nearly truncate, spreading, or very slightly 4-lobed. Petals obtuse, blue. Epigynous disk very distinct. Fruit spherical, size of a pea, crowned with the calyx-limb.

Western peninsula and Ceylon up to 4000′; North Kanara in evergreen forests, common in the forests near the Dodmune ghât. Fl. C. and. H. S. A

small tree. Bark same as that of *M. edule*. Wood light or dark-grey, hard, smooth, heavy, close-grained. Annual-rings distinctly marked by a layer of dark tissue. Pores very small in patches of white tissue. Medullary rays fine, uniform, numerous. Weighs 60 lbs. to the cub. ft.

5. M. terminale, Dalz. in Hook. Kew. Jour. III, 121; Fl. Br. I. 2, 558; Dalz. &. Gibs. Bomb. Fl. 93; Cooke Fl. Pres. Bomb. 1, 504.

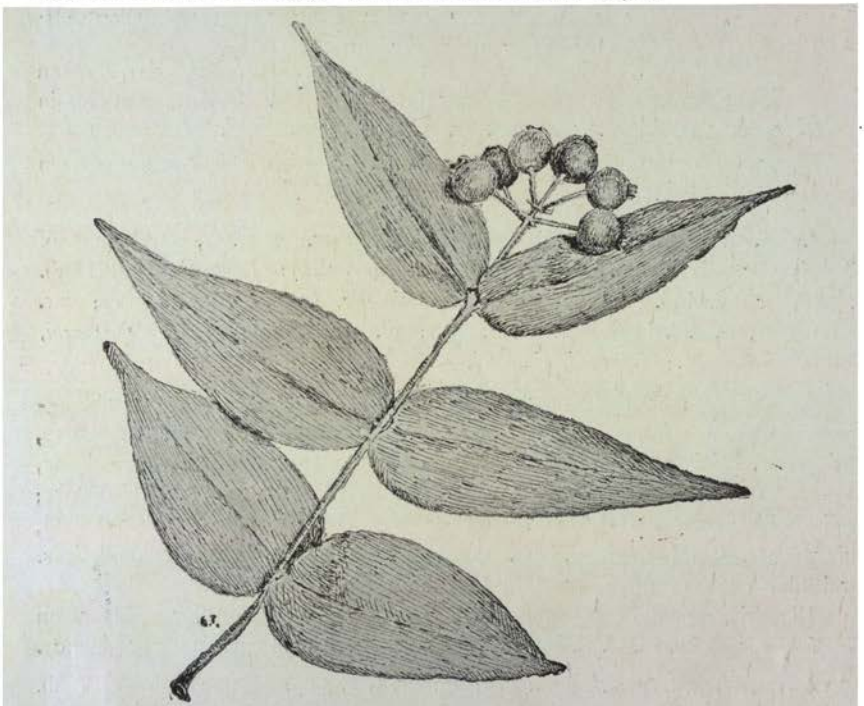

Fig 321. Memecylon terminale, Dalz.

A small shrub 2′-8′ high with a few, erect or sometimes trailing branches; branchlets terete. Leaves nearly sessile, rounded or slightly cordate at the base, ovate or ovate-lanceolate, 1·5″-2·5″ by ·5″-1·25″, very acute or acuminate, dark-green above, pale beneath, coriaceous; margins slightly revolute; lateral-nerves very obscure; midrib strong beneath. Flowers blue, on slender pedicels, in terminal or axillary, peduncled umbels; peduncles slender, 2-4-fascicled, ·5″-·75″ long; pedicels numerous, very slender, bracteolate at the base, shorter than the peduncles. Calyx-tube short, campanulate, ·12″ across; limb truncate. Petals blue, ·1″ long, ovate, obtuse. Fruit globose, ·4″ in diameter, crowned with the calyx-tube.

This species differs from the *M. amabile*, Bedd. in having terete branchlets.

Southern ghâts of the Deccan peninsula. Fl. Br. I. In the rain-forests of North Kanara, from Ainshi southwards. Fl. Dec.-Feb. Fr. ripe March.-May. The beautiful blue-coloured flowers of this shrub are very ornamental.

Order XLIV. LYTHRACEÆ.

Trees, shrubs or herbs; branches often quadrangular. Leaves simple, opposite; stipules O or minute. Flowers regular, hermaphrodite. Calyx cup-shaped, persistent, 3-6-lobed; lobes often with intermediate teeth. Petals imbricate, crumpled in bud, as many as calyx-lobes, rarely O, inserted near the top of the calyx-tube. Stamens definite or indefinite, on the calyx-tube. Ovary free, 2-6-celled; style long; stigma capitate or 2-lobed; ovules many; placentas axile. Fruit a capsule, 1-2-4 or many-celled. Seeds numerous, sometimes winged, exalbuminous.

Ovary superior.
- Stamens 12 ... ... 1. Woodfordia,
- Stamens 8 ... ... 2. Lawsonia.
- Stamens indefinite.
  - Fruit a 3-6-valved capsule ... ... 3. Lagerstrœmia.
  - Fruit many-celled, indehiscent ... ... 4. Sonneratia.

Ovary inferior ... ... 5. Punica.

1. WOODFORDIA, SALISB.

A shrub. Leaves subsessile, lanceolate, usually cordate, black glandular-dotted. Flowers scarlet, in axillary, pedunculate cymes. Calyx long-tubular, curved; mouth oblique. Petals 6, small or O, at top of the calyx-tube. Stamens 12. Ovary free, sessile, 2-celled; ovules many; style filiform; stigma small. Capsule membranous, included in the calyx-tube. Seeds many, smooth.

W. floribunda, Salisb. Parad. Lond. t. 42; Brandis For. Fl. 238; *W. tomentosa*, Bedd. Fl. Sylv. 117; Cooke Fl. Pres. Bomb. 1, 510; Gamble Ind. Timb. 369; *Grislea tomentosa*, Roxb.; Dalz. & Gibs. Bomb. Fl. 97. *Dayati, dhaiphal, phusati,* M.; *Dhauri, dowari,* Vern.; *Dhai,* Sind.; *Dhavadina,* Guz.

A large, deciduous, much branched shrub; branchlets terete, clothed with white pubescence. Leaves ovate-lanceolate, acute, rounded or cordate at the base, 1·5″-4″ by ·5″-1″, dark-green, softly tomentose above, hoary beneath; the black glandular dots are more or less regularly and sparsely distributed and are sometimes wanting on the upper side; lateral-nerves 6-12 pairs, prominent beneath, curved upwards and uniting in a more or less distinct intramarginal vein. Flowers numerous, in short, cymose panicles from the axils of fallen

leaves on the old wood, rarely from the present leaf-axils; pedicels short, pubescent. Calyx .5″ long, with a short campanulate base and a long, striate, slightly curved, bright-red, funnel-shaped pubescent tube; mouth of tube oblique; teeth triangular, acute. Petals slightly longer than the calyx-teeth, linear, very acute. Stamens declinate, much exserted. Capsule enclosed in the persistent calyx-tube, usually splitting the calyx-tube near the base, irregularly dehiscent; seeds very numerous, cuneate, wedge-shaped, smooth, brown.

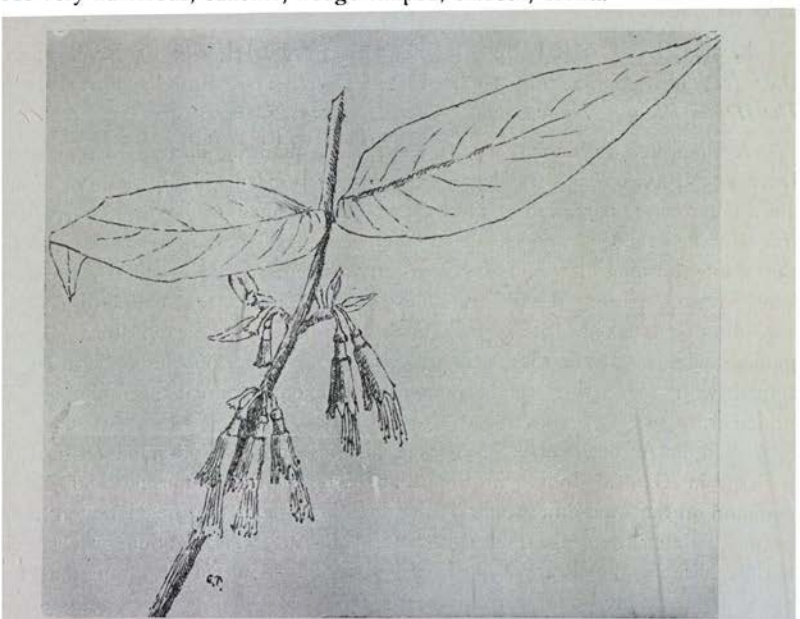

Fig 322. Woodfordia floribunda, Salisb.

Throughout India, ascending to 5000′ in the Himalayas; throughout the presidency, in monsoon-forest, on laterite at Mahableshwar and on trap in the Akrani, common in the Konkan and North Kanara near the sea-coast. Fl. Oct.-Apl. Stem irregularly fluted, 3″-4″ in diameter. Bark thin, grey, scaling off in small patches; inner-bark pink. Wood close-grained, very hard and compact; sapwood yellowish, enclosing an irregularly shaped dark-brown heart-wood. Pores small, oval, scanty. Medullary rays fine, closely packed. Annual-rings distinct. Narrow long or short masses of red bark are often enclosed in the wood. Used for fuel. The flowers yield a dye, and the leaves one of the most commonly employed tans in India.

2. LAWSONIA, Linn.

An erect, sometimes spinous shrub. Leaves opposite, entire. Flowers in terminal, panicled cymes. Calyx-tube very short; lobes 4, ovate. Petals 4, wrinkled. Stamens usually 8. Ovary free, 4-celled; ovules many; placentas axile; style very long; stigma capitate. Seeds many, smooth, on a central placenta.

L. alba, Lamk. Ill. t. 296, fig. 2; DC. Prodr. III, 91; Fl. Br. I. 2, 573; Dalz. & Gibs. Bomb. Fl. 97; Bedd. Fl. Sylv. 118; Brandis For. Fl. 238. *The Henna Plant; Hênne, mendie,* Vern.; *Gorantlu,* K.

A glabrous deciduous shrub; branchlets quadrangular, often spinescent. Leaves ·5″-1·25″ by ·25″-·6″, nearly sessile, ovate or lanceolate, acute or obtuse, often mucronate, narrowed at the base. Flowers small, white or rose-coloured, fragrant, less than ·5″ across, arranged in long, axillary and terminal panicles; the whole forming large, pyramidal inflorescences. Calyx-tube very short; lobes ovate, acute. Petals ·12″ long, suborbicular, with undulate margins, spreading or deflexed. Stamens 8, inserted in pairs on the calyx-tube. Capsule globose, size of a pea with a brittle pericarp, seated on the calyx-tube and tipped with the style; seeds numerous, angular, truncate; cotyledons flat, orbicular.

Wild in Arabia, Persia, and Beluchistan; on the Coromandel Coast and perhaps in Central India; in the drier parts of the peninsula and Ceylon, common on the sand-dunes near Tuticorin; throughout the presidency in hedges principally near the sea-coast. Fl. & Fr. April-Aug. A large thin, grey, smooth-barked shrub. Wood grey, hard, close-grained. Cultivated throughout India as a hedge plant and for its leaves which yield when pounded into a paste the well known cosmetic dye so largely used in the East.

3. LAGERSTRŒMIA, Linn.

Trees and shrubs. Leaves opposite or the uppermost alternate, entire. Flowers bracteate in axillary or terminal panicles. Calyx-tube funnel-shaped, smooth or ribbed, cleft into 6, ovate lobes. Petals 6, clawed; margins undulate. Stamens numerous; filaments long-exserted. Ovary sessile, 3-6-celled; ovules numerous on axile placentas; style long, bent; stigma capitate. Fruit a coriaceous capsule, 3-6-celled, loculicidally dehiscent. Seeds many, ascending or horizontal; testa winged.

Calyx-tube smooth; lobes adpressed. Fruit ·5″-1″ long	1. L. parviflora.

Calyx-tube smooth; lobes patent or reflexed.
Fruit small, ·3″-·6″ long ... ... 2. L. lanceolata.
Calyx-tube ribbed, tomentose; lobes spreading 3. L. Flos-Reginæ.

1. L. parviflora, Roxb. Fl. Ind. 2, 505; Bedd. Fl. Sylv. t. 31; Cooke Fl. Pres. Bomb. 1, 512; Gamble Ind. Timb. 371; *L. lanceolata,* Dalz. & Gibs. Bomb. Fl. 98; Brandis For. Fl. 239; Bedd. Fl. Sylv. t. XXXII. (**var.** *majuscula,* Fl. Br. I.). *Chunungi, sokutia, bondareh,* Vern.; *Lende, bondga,* M.; *Chino,* Bhil.

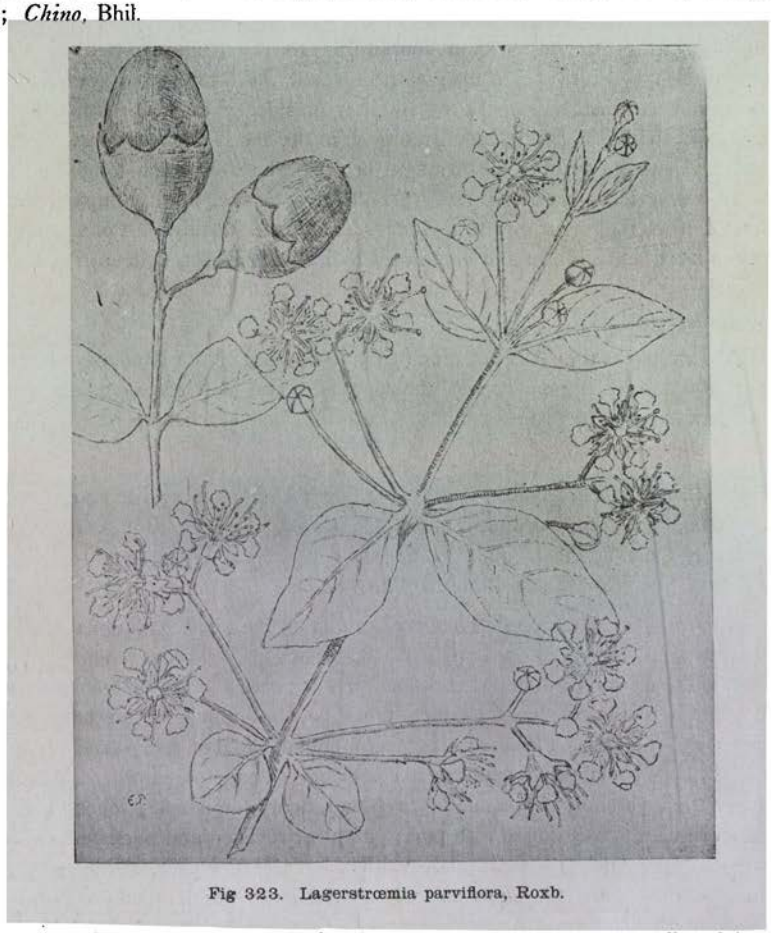

Fig 323. Lagerstrœmia parviflora, Roxb.

A moderate-sized or small, deciduous tree; young parts usually glabrous. Leaves opposite, 2″-4″ by 1·5″-2·5″, elliptic-oblong, acute or acuminate, obtuse at

the apex, coriaceous, green, glabrous above, usually glabrous and glaucous beneath; lateral-nerves about 6 pairs, inconspicuous beneath; petioles 0-·25″ long. Flowers white, fragrant, ·75″ across, in axillary and terminal, usually many-flowered leafy panicles, often on the old wood. Calyx-tube subhemispheric, ·2″ across, glabrous or puberulous; lobes 6, triangular, acute, ultimately woody and closely adpressed to the fruit. Petals white, broadly obovate, with a ·2″ long, slender claw, undulate on the margin. Capsule ovoid or obovoid, ·75″-1″ long; seeds winged, ·5″ long; wing thin on the inside edge, thick on the outer.

Throughout peninsular India in mixed deciduous forests; lower Himalayas from the Sutlej to Assam and southwards to the Nilghiris, Bengal, Upper Burmah and Western peninsula; monsoon and thorn-forests of the Konkan, Deccan and North Kanara. In the Bombay presidency does not attain to anything more than a moderate-sized tree even in the moist monsoon-forests of N. Kanara. Usually a small tree with a light-brown bark exfoliating in long thin scales like the *Teak*; inner-bark light-red. Wood grey, elastic, hard, compact, darker coloured near the centre. Annual-rings sometimes distinct. Pores small or medium-sized, enclosed in and connected by irregular, short, concentric bands of light-coloured tissue. Weighs about 54 lbs. to the cub. ft. Medullary rays fine, numerous, equidistant.

The excellent timber is not much used in Kanara or the Konkan, elsewhere it serves extensively for a variety of purposes. The bark gives a black colour to leather when employed as a tan, also used for making coarse ropes. Yields a sweet edible gum.

2. L. lanceolata, Wall., Fl. Br. I. 2, 576; Brandis For. Fl. 240; Brandis Ind. Trees, 338; Gamble Ind. Timb. 372; Cooke Fl. Pres. Bomb. 1, 513; *L. parviflora,* Dalz. & Gibs. Bomb. Fl. 98; *L. microcarpa,* Wgt., Ic. t. 109; Bedd. Fl. Sylv. t. 30; Talb. Trees Bomb. 176. *Benteak; Bili-nandi,* K.; *Nana,* M.

A large, deciduous tree. Leaves elliptic-lanceolate or broadly ovate, 2·5″-4″ by ·75″-2″, acute or very shortly acuminate, coriaceous, glabrous, shining above, usually white or greyish-blue, hoary-tomentose beneath; lateral-nerves about 10 pairs, curving upwards, very distinct, more or less prominent on both sides; petioles ·25″-·5″ long. Flowers in large compound, axillary and terminal, leafy panicles; buds ovoid, usually pubescent; pedicels ·1″ long, tomentose. Calyx-tube hemispheric or broadly campanulate, ·2″ broad, hoary tomentose; lobes about ·1″ long, triangular, acute, tinged with pink; patent or reflexed and persistent in fruit. Petals ·20″ long, obovate, spathulate, with a long slender claw, caducous. The 6 outer stamens are 1·5 times as long as the inner which number about 30; anthers of the outer red of the inner yellow. Capsules 3″-·6″ long, ellipsoid; seeds winged, about ·25″ long.

Western peninsula from Bombay southwards to Travancore; throughout the presidency in monsoon-forest from the Surat Dangs to N. Kanara in which latter district it attains to large dimensions; common on the higher Supa ghâts where it is a conspicuous and beautiful tree when in full flower during the hot season; also found, though somewhat sparingly distributed, along the Deccan ghâts, absent from the Mahableshwar laterite area. Fl. Mch.-Apl. Fr. Nov.-July.

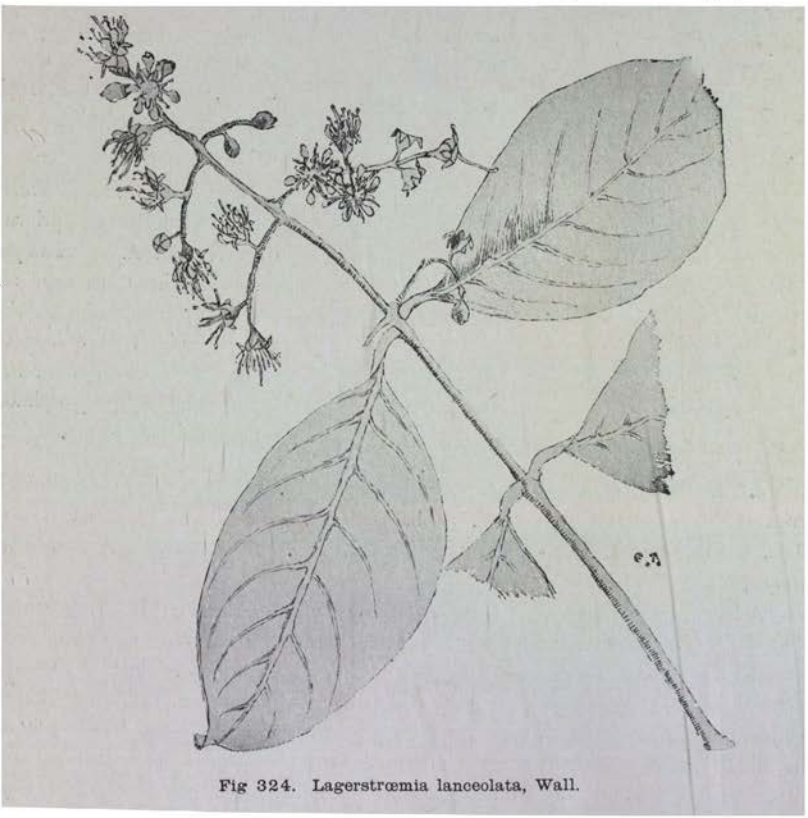

Fig 324. Lagerstrœmia lanceolata, Wall.

A large tree with smooth, white bark, peeling off in large papery strips; inner-bark white, fibrous, ·25″ thick, in concentric rings; the layer nearest the cambium turns black on exposure. Wood reddish, moderately hard, strong, tenacious and elastic. Pores large to small, often crowded in the spring wood, showing the annual growth, enclosed in and sometimes connected by white tissue. Medullary rays fine, numerous, equidistant. Weighs about 46 lbs. to the cub. ft.

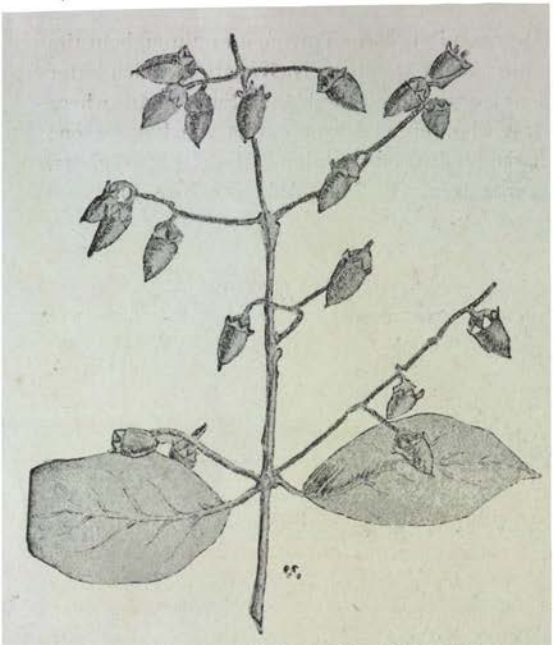

Fig 325. Lagerstrœmia lanceolata, Wall.—*(Fruit.)*

One of the principal timbers in North Kanara and the Nilghiris, is much in request for house-building and construction purposes, boxes and furniture, liable to split, decays rapidly when exposed to the weather in open depôt, possesses considerable transverse strength, P = 542 for North Kanara wood.

Wallich's *L. lanceolata,* published in 1828 has priority over Wight's *L. microcarpa,* published in 1840 and as they are undoubtedly the same species I have had to substitute the former for the latter which is in my opinion a more suitable name.

3. **L. Flos-Reginæ,** Retz Obs. Fasc. 5, 25; Fl. Br. I. 2, 577; Cooke Fl. Pres. Bomb. 1, 513; Gamble Ind. Timb. 373; *L. reginæ,* Bedd. Fl. Sylv. t. 29; Dalz. & Gibs. Bomb. Fl. 98; Brandis For. Fl. 240. *Hole-dasal,* K.; *Bondara, taman,* M.

A large, deciduous tree. Leaves 4″-8″ by 1·5″-3″, glabrous, thinly coriaceous, oblong lanceolate, acuminate, or subacute, dark-green above, pale beneath; lateral-nerves about 12 pairs, strong beneath; petioles about .3″ long. Flowers purple-lilac, 2″-3″ across, in large terminal panicles sometimes more than 12″ long; pedicel stout, pubescent, with 2, thick, short, ovate, opposite bracteoles about the middle where it is articulate. Calyx turbinate, ·6″ long, densely tomentose, with 12-14 prominent ribs, those opposite the calyx-teeth broader; lobes 6-7, triangular, acute, spreading, thickened at the margins. Petals suborbicular, 1″-1.5″ long, long-clawed, spreading, undulate and crumpled. Stamens equal. Style about 1″ long; stigma shortly 2-lobed. Capsule broadly ovoid, ·75″-1″ long, seated on the woody, ribbed calyx; seeds winged, ·75″ long, pale-brown.

E. Bengal, Assam, Burmah, moist-low country of Ceylon and the West Coast. On the North Kanara and Southern Konkan ghâts along the banks of nalas and rivers and in swampy localities, sometimes cultivated as an ornamental tree. Fl. H. S. Fr. R. S.

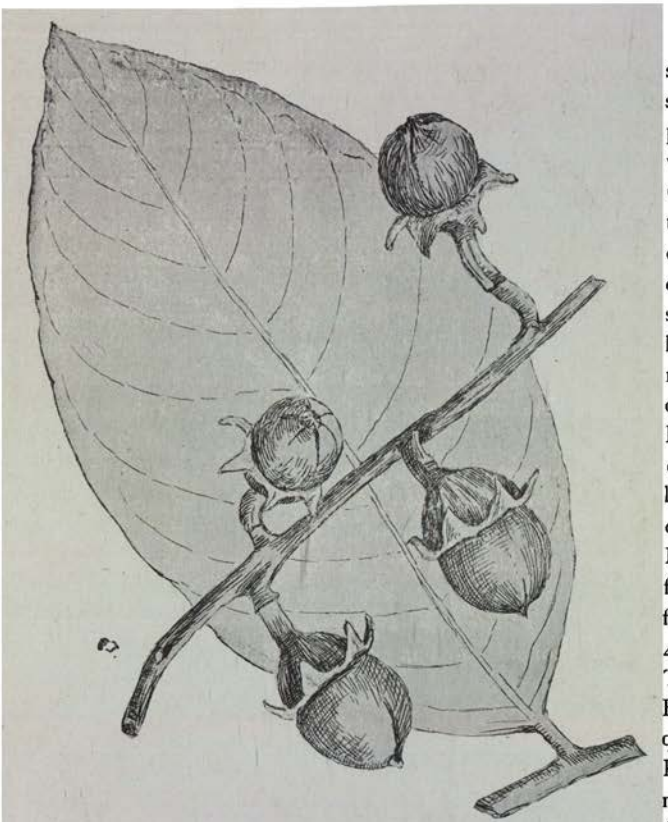

Fig 326. Lagerstœmia Flos-Reginæ, Retz.—*Fruit.*

A large tree. Bark smooth, white, scaling off in thin plates; inner bark white, fibrous. Cambium soon turning dark-coloured when exposed. Wood shining, light-red, hard. Annual-rings marked by a belt of large pores. Pores of all sizes connected by wavy lines of light-coloured tissue. Medullary rays fine, and extremely fine. Weighs about 45 lbs. to the cub. ft. The wood from Burmah is frequently very porous. Kanara wood is more compact. An excellent timber, used for gun-carriages, ship-building, carts, &c. One of the principal timbers in Assam, Eastern Bengal and Burmah, but is scarcely commercially known in the Bombay presidency as although large trees are found in Kanara they are neither numerous nor in convenient situations.

L. indica, Linn.; DC. Prodr. III, 93; Fl. Br. I. 2, 575. Cultivated in gardens throughout the presidency for its beautiful flowers, is a native of China.

4. SONNERATIA, Linn. f.

Trees growing near the sea in the Mangrove formation and furnished with spongy pneumaphores (sui generis). Leaves opposite, entire, thick. Flowers large, solitary or in 3-flowered cymes. Calyx thick, coriaceous; tube adnate to

the base of the ovary; lobes 4-8, valvate. Petals 4-8 or O. Stamens many, inserted in the throat of the calyx-tube, inflexed in bud. Ovary nearly free, 10-15-celled with thin septa; style long; stigma capitate. Fruit large, supported by the persistent calyx. Seeds many, curved, angular; cotyledons short, foliaceous, convolute; radicle elongate, terete.

Calyx-lobes 4.	Petals O ...	...	...	1. S. apetala.
Calyx-lobes 6.	Petals 6 ...	...	...	2. S. acida.

1. S. apetala, Ham. in Syme Emb. Ava. III, 313. t. 25; Fl. Br. I. 2, 579; Gamble Ind. Timb. 376; Cooke Fl. Pres. Bomb. 1, 514. *Kandal, undi, Charungi*, M.

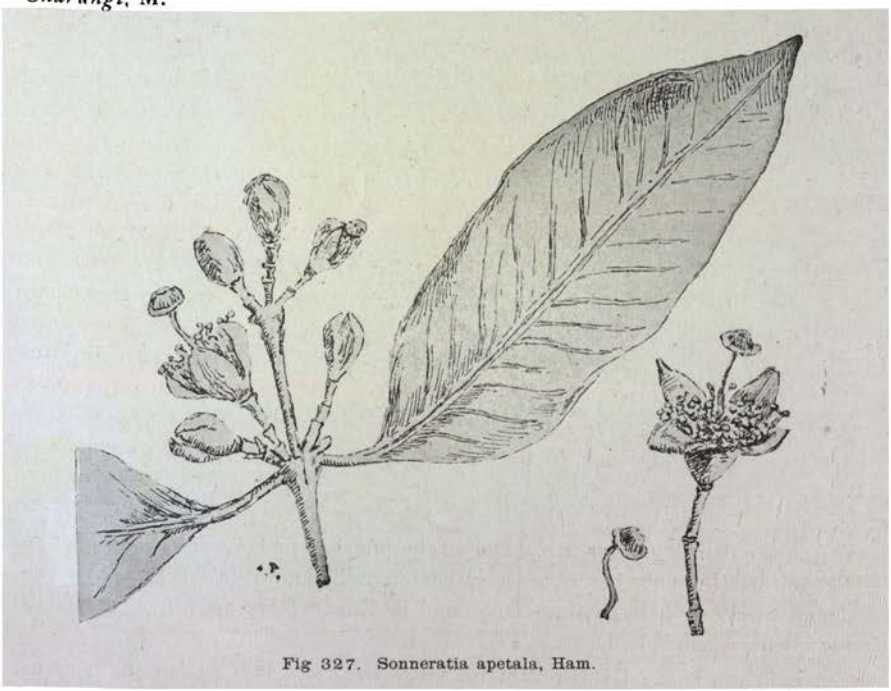

Fig 327. Sonneratia apetala, Ham.

A small or medium-sized, often gregarious, evergreen tree with slender drooping branches. Leaves oblong-lanceolate, 2″-4″ by 1″-1·5″, tapering at the base into a short petiole, obtuse at the apex, thick, glabrous; lateral-nerves not conspicuous. Flowers large, solitary or in 3-5-flowered, terminal corymbs; pedicels articulated with the flowers, ·5″-·75″ long. Calyx ·75″ long; tube cup-shaped; lobes 4, valvate, ovate-oblong, acute, deflexed. Petals O. Stamens slightly exserted. Style long, crumpled in bud, crowned with the broad white,

saucer-shaped stigma. Fruit depressed-globose, ·75″ in diameter, white, smooth, tipped with the base of the style.

Tidal forests of Bengal and Burmah, Konkan; common along the Tannah creeks and back waters, appears to replace *S. acida*, so abundant in the South Konkan and North Kanara mangrove swamps. Bark black, smooth, shining, covered with oval lenticels. Heartwood reddish-brown, moderately hard. Pores small, numerous, oval, subdivided in 2 or 3 sections. Medullary rays fine, numerous, bent round the pores. Weighs 35 lbs. to the cub. ft. Used for house building, packing-cases, &c. Yields an excellent fuel.

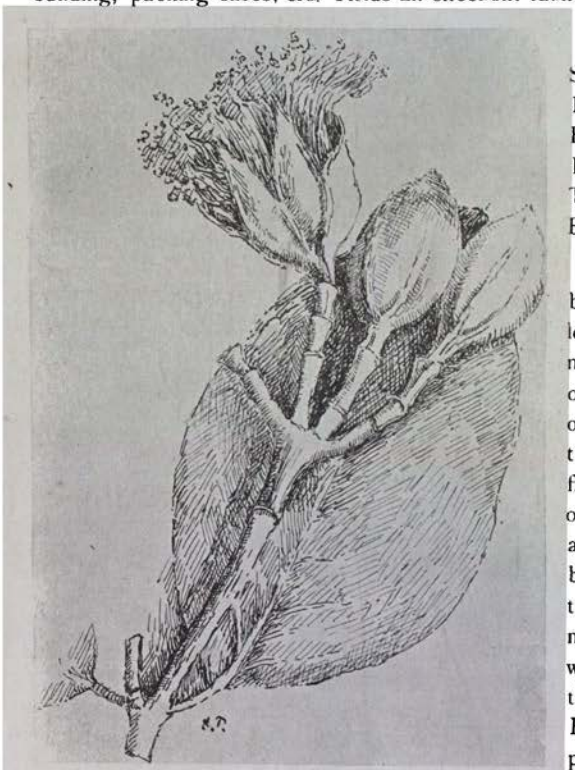

Fig 328. Sonneratia acida, Linn.

2. S. acida, Linn. f. Suppl. 252; Fl. Br. I. 2, 579; Dalz. & Gibs. Bomb. Fl. 98; Brandis For. Fl. 242; Bedd. Fl. Sylv. 118; Gamble Ind. Timb. 377; Cooke Fl. Pres. Bomb. 1, 514. *Chipi,* Vern.

A small, evergreen tree; branches with black, shining, lenticellate bark. Leaves nearly sessile, elliptic-oblong or obovate, 2″-4″ by ·75″-2·5″, obtuse at apex, narrowed into the very short petiole, slightly fleshy. Flowers large, white or red, about 3″ long, solitary at the ends of the branches; buds without ribs. Calyx-tube shallow, hemispheric, not ribbed; lobes 6, red within, acute, longer than the tube, about ·75″ long. Petals dark-purple, linear, persistent, slightly larger than the calyx-lobes. Stamens about 2″ long, erect. Ovary at first quite free, afterwards grows and fills up the whole of the calyx-tube; style very long, often exceeding 2″. Fruit 1″-2″ in diameter, sub-globose or ovoid, seated on the enlarged calyx, rounded at the apex and tipped with the persistent tapering style-base which is about 1″ long.

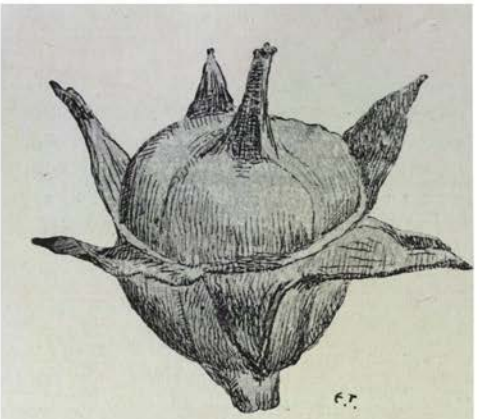

Fig 322. Sonneratia acida, Linn.—*Fruit.*

Coasts of India, Burmah and the Andamans, delta of the Indus. In the salt marshes and creeks of the Konkan and North Kanara. Fl. Mch.-July. Fr. Oct.-Nov. A small evergreen tree. Wood reddish-grey, soft, even-grained. Pores small, numerous. Medullary rays fine, numerous, not very distinct. Weighs 36 lbs. to the cub. ft. Yields an excellent fuel used in Ceylon on board coasting steamers. The pneumatophores are sometimes used as a substitute for cork.

Punica granatum, Linn.; Roxb. Fl. Ind. II, 499; Brandis For. Fl. 241. *The Pomegranate*, is cutivated in gardens throughout the presidency. Wild in Kashmir and the N. W. Himalayas. Fl. Apl. May. Fr. July-Sept. A shrub or small tree. Wood light-yellow, might be tried as a substitute for boxwood. The bright-scarlet flowers yield a light-red dye. The bark and rind of the fruit are used for tanning and dying morocco leather. The root bark is used in medicine as an anthelmintic.

Order XLV.—SAMYDACEÆ.

Trees or shrubs. Leaves simple, alternate; stipules small or O, deciduous. Flowers regular, small, axillary, shortly pedicelled, fascicled or in long, simple or panicled racemes; pedicels articulated at or near the base, bracteolate. Calyx coriaceous, persistent; tube short, free or adnate to the ovary; limb 3-7-fid. Petals as many as calyx-lobes or O, imbricate. Stamens definite or indefinite, usually opposite the petals and alternating with small glands. Ovary superior or more or less inferior, 1-celled; style 1, capitate or 3-fid at the apex or styles 2-5; ovules on usually 2-5 parietal placentas. Fruit loculicidally 2-5-valved. Seeds several, albuminous; cotyledons oblong often foliaceous; radicle short or elongate and terete.

Flowers in axillary fascicles. Petals O ...	1.	Casearia.
Flowers in axillary or terminal racemes. Petals present	2.	Homalium.

1. CASEARIA, JACQ.

Shrubs or small trees. Leaves alternate, distichous often slightly serrate and transparently dotted; stipules small, lateral, caducous. Flowers small, yellow, in axillary fascicles. Calyx-tube short; limb 4-5-lobed. Petals O. Stamens 6-15, rarely more, alternating with as many scales or staminodes. Ovary superior, 1-celled; ovules many, parietal; stigma capitate or shortly 3-lobed. Fruit fleshy, opening into valves; seeds many, angular, often with a red arillus; embryo straight.

Leaves glabrous, shining on both sides. Pedicels glabrous. Leaves crenate-serrate. Calyx pubescent	1.	C. glomerata.
Calyx glabrous	2.	C. esculenta.
Pedicels pubescent. Leaves entire	3.	C. rubescens.
Leaves tomentose beneath	4.	C. tomentosa.

1. C. glomerata, Roxb. Fl. Ind. 2, 419; Fl. Br. I. 2, 591; Brandis Ind. Trees, 343; *C. graveolens,* Dalz. in Hook. Jour. Bot. IV. 107; Dalz. & Gibs.

Bomb. Fl. 11; Fl. Br. I. 2, 592; Brandis For. Fl. 243; Cooke Fl. Pres. Bomb. 1, 520; Gamble Ind. Timb. 378. *Bohkara, bokhada,* M.

A small deciduous tree; branches spreading. Leaves ovate, 3·5″-8′ by 1·5″-4″, acuminate, more or less crenate-serrate, coriaceous, dotted with round or elongated, translucent, resinous glands; lateral-nerves 8-12 pairs, prominent beneath; petioles ·5″ long. Flowers 4-5-merous, greenish-yellow with an unpleasant smell, densely clustered on axillary tubercles on the old wood; pedicels articulated above the base, very short, pubescent below, usually glabrous above the articulation. Calyx pubescent, ·12″ long, shorter than the pedicels. Stamens 8-10, alternating with hairy, linear scales or staminodes which are half as long as the glabrous filaments. Style short; stigma 3-lobed. Fruit ovoid, deep-yellow, about ·75″ long, glabrous, 3-valved; arillus orange-coloured.

Sub-Himalayan tract from the Chenab eastwards, ascends to 7000′ in Sikkim, Oudh and Central India, Konkan and Deccan ghâts in open situations; ascends to 4000′ in the Khandesh Akrani.

Brandis in his Indian Trees p. 343 correctly states that *C. graveolens*, Dalz. cannot be kept distinct from *C. glomerata*, Roxb. which latter name has priority and is accordingly adopted.

Usually a large shrub or small tree in open situations in moist forests along the ghâts. Old foliage on the tree in April in the Akrani at 3700′; it is probably evergreen at higher elevations.

Bark dark-grey, wrinkled. Wood light-yellow, moderately hard and even-grained, Pores small, oval, subdivided. Medullary rays fine, equidistant, showing as a silver-grain. Weighs about 40 lbs. to the cub. ft. Gamble states that it is suitable for carving, plates etc. The fruit is used to poison fish.

2. C. esculenta, Roxb. Fl. Ind. II, 422; Fl. Br. I. 2, 592; Bedd. Fl. Sylv. 119; Cooke Fl. Pres. Bomb. 1, 520; Gamble Ind. Timb. 379; *C. lævigata,* Dalz. & Gibs. Bomb. Fl. 11; *C. varians,* Thw. Enum. 19; Bedd. Fl. Sylv. t. 208. *Mori, kulkulta, pate,* M.

A small deciduous tree; branchlets slender, glabrous. Leaves obovate, or elliptic, 2·25″-5″ by ·75″-2″, acuminate, thinly coriaceous, more or less crenate-serrate, narrowed at the base into a short petiole; lateral-nerves about 6 pairs, distinct on the shining glabrous sides of the leaf; stipules minute, scale-like, persistent. Flowers glabrous, ·12″ long, in clusters in the axils of present and fallen leaves; pedicels glabrous, longer than the calyx, articulated at the base which is surrounded with numerous scale-like bracteoles. Calyx-lobes 4-5, glabrous, ovate, obtuse, persistent, ·1″ long and broad, sometimes ciliolate, membranous on the margins. Stamens 8; staminodes nearly as long as the filaments, oblong, obtuse, ciliate or hairy. Fruit bright-yellow, ellipsoid, about ·75″ long, 2-3-valved; seeds immersed in red pulp.

Western peninsula from Bombay to Coorg; throughout the moist monsoon-forests of the Konkan and North Kanara, common on the hills near Karwar. Fl. May-June. Fr. Aug.-Sept. Small tree. "Wood white, moderately hard, even-grained. Pores small, scanty. Medullary rays fine, numerous giving a satiny silver-grain." Gamble. Wood and leaves used medicinally and the fruit is eaten in Ceylon.

3. C. rubescens, Dalz. & Gibs. Bomb. Fl. 11; Fl. Br. I. 2, 593; Cooke Fl. Pres. Bomb. 1, 521; Gamble Ind. Timb. 378.

A large deciduous shrub or small tree. Leaves broadly ovate or elliptic. 3"-8" by 1·75"-4", shortly acuminate, thinly coriaceous, glabrous, shining on both sides, margins entire; lateral-nerves about 10 pairs, conspicuous beneath; stipules minute, glabrous. Flowers pedicelled, in axillary fascicles; pedicels stout, pubescent, articulated near the base. Calyx-lobes broadly ovate, more or less white-pubescent outside, membranous on the margins. Stamens 8; filaments hairy; staminodes oblong, hairy at the truncate tips. Fruit ovoid, glabrous, crowned with the remains of the style-base and seated on the persistent calyx tube.

Bombay ghâts, Konkan and Coorg. "On the ghâts to the south," Dalz. In the forests near the Nilkund ghât of North Kanara. Fl. C. S. Fr. H. S. A large shrub or small tree scarcely more than a variety of *C. glomerata,* Roxb.

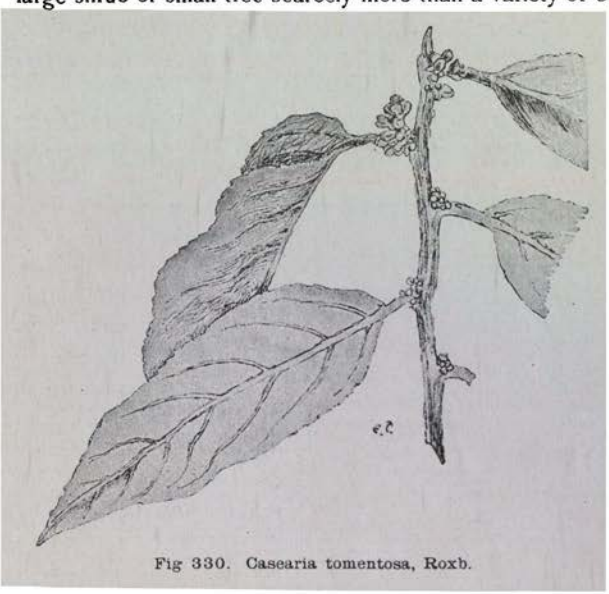

Fig 330. Casearia tomentosa, Roxb.

4. C. tomentosa, Roxb. Fl. Ind. II, 421, Brandis For. Fl. 243; Bedd. Fl. Sylv. 119; Cooke Fl. Pres. Bomb. 1, 520; Gamble Ind. Timb. 379; *C. Anavinga,* Dalz. & Gibs. Bomb. Fl. 11. *Bairi, chillara,* Vern.; *Modi, modgi,* M.; *Tordul,* Bhil, *Bilioobina,* K.

A small tree; branchlets pubescent or tomentose with a bitter bark. Leaves distichous, oblong-lanceolate, 2·5"-6" by 1·5"-2·5", acute at the apex, narrowed into the petiole and oblique at the base, coriaceous, glabrous above, pubescent or tomentose beneath, serrate, dotted with round or elliptic, translucent glands; lateral-nerves about 10 pairs, strong beneath;

stipules minute, caducous; petioles stout, ·25″-·5″ long. Flowers greenish-white, ·1″ long, tomentose, densely crowded on scaly, axillary tubercles; pedicels about ·2″ long, tomentose, articulated near the base. Calyx-lobes broadly ovate, obtuse; tube very short. Stamens usually 8, alternating with short ciliate staminodes which are villous at the apex. Fruit ellipsoid, 6-ribbed, 3-valved, ·75″ long, smooth, shining; seeds immersed in the soft, red pulp of the agglomerate arils.

Sub-Himalayan tract from the Indus eastwards, Oudh, E. Bengal, Central, Southern and Western India; throughout the presidency in deciduous forests, common. Fl. Jan.-May. Fr. H. & R. S. Small or moderate-sized tree. Bark thin, scaly. Wood yellowish-white, close-grained, moderately hard. Annual-rings usually indistinct. Pores small, single or in radial lines. Medullary rays fine, numerous, wavy, distinct. Weighs 45 lbs. to the cub. ft. Wood suitable for carving. "Used for making combs." Brandis. Bark bitter, sometimes mixed with "*Kamela*" powder. The pounded fruit serves for poisoning fish.

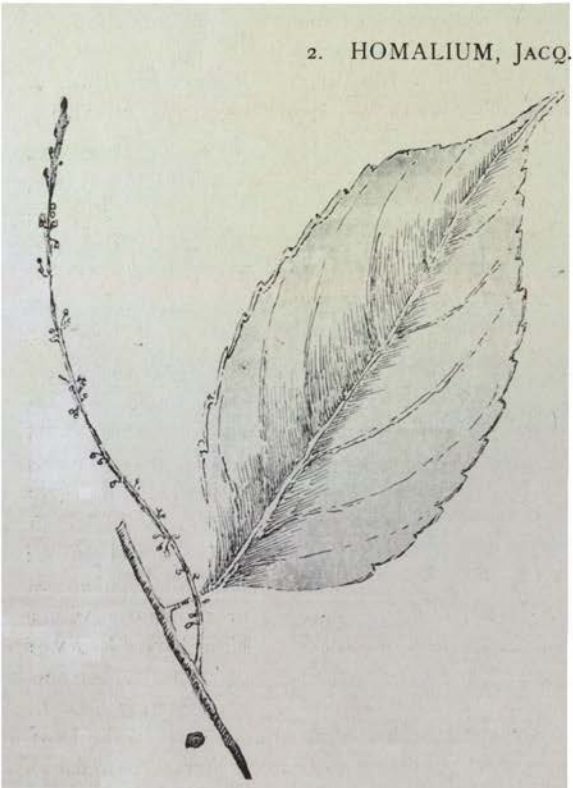

Fig 331. Homalium zeylanicum, Benth.

2. HOMALIUM, Jacq.

Shrubs or trees. Leaves alternate, crenate, rarely entire; stipules small, rarely O. Flowers hairy, in slender, simple or panicled racemes; pedicels bracteate at the base. Calyx-tube adnate to the base of the ovary; lobes 5-7, narrow, persistent. Petals 5-7, inserted on the throat of the calyx, persistent. Disk tomentose. Stamens 1 or 1-7-fascicled, opposite the petals, with alternating glands. Ovary ½-superior, 1-celled; styles 2-5, filiform; ovules many or several; placentas parietal. Capsule ½-superior, coriaceous, 2-5-valved at the apex. Seeds few, angular or oblong.

H. zeylanicum, Benth, in Jour. Linn. Soc. IV, 35; Fl. Br. I. 2, 596; Bedd. Fl. Sylv. t. 210; Cooke Fl. Pres. Bomb. 1, 522; Gamble Ind. Timb. 381; Trimen Fl. Ceyl. 2, 239.

A large or medium-sized tree. Leaves ovate or obovate, 3″-4″ by 1·5″-2″, shortly acuminate, narrowed into the petiole at the base, crenate-serrate, thinly coriaceous, glabrous and shining on both sides; lateral-nerves about 8 pairs, distinct beneath; petioles ·25″-·5″ long, sometimes slightly scaly. Flowers pedicellate, hairy, small, about ·1″ across, in slender, simple or panicled racemes, longer than the leaves, arranged in many-flowered more or less distant clusters along the slender rachis; pedicels very short, articulated beneath the calyx; buds obovoid or nearly globose, white-tomentose. Calyx-tube shortly turbinate, pubescent; lobes 4-5, longer than the tube, ciliate on the margins, spreading. Petals as many as the calyx-lobes and slightly longer, obovate, ciliate. Stamens as many as the petals; alternating glands rounded. Styles 3-4. Fruit apparently unknown.

Malabar up to 4000′, Ceylon, moister parts up to 3000′; in the rain-forests of the northern ghâts of North Kanara from Diggi to Ainshi, sparsely distributed. Fl. April-May. Fl. R. S. A moderate-sized tree. Bark smooth, grey, lenticellate, mealy; inner-bark white, thick. "Wood reddish, even-grained, rough, darker near the centre in irregular masses. Pores moderate-sized in radial or oblique lines. Medullary rays very fine, closely packed. Weighs about 52 lbs. to the cub. ft." Gamble. "Wood strong and valuable for building purposes." Bedd.

Order XLVI.—PASSIFLORACEÆ.

An order of small importance to the Indian forest officer, containing several cultivated species of *Passiflora*, (Passion flowers) tendril-twining shrubs indigenous in tropical America. *P. Leschenaultii*, D.C. is indigenous in the Nilghiris but does not extend to Bombay. *P. fœtida*, Linn. a pretty flowered climber with a green mossy involucre, is common near villages and in waste places throughout the presidency, originally a garden escape. *Carica Papaya*, Linn. the well known *Papaw tree*, a soft wooded species introduced from South America is cultivated throughout the Bombay presidency for its valuable melon like fruit. *Papaw* leaves possess the remarkable property of making meat wrapped in them tender.

Order XLVII.—DATISCACEÆ.

Trees or herbs. Leaves alternate, simple or pinnate, exstipulate. Flowers small, dicœcious, clustered, racemed or panicled. Male fl.: Calyx-tube short or hemispheric; teeth 3-9. Petals O; stamens 4-25. Ovary O or rudimentary. Female Fl.: Calyx-tube adnate to the ovary; lobes 3-8. Petals O. Ovary 1-celled, open or closed at the vertex; styles lateral; placentas parietal; ovules many. Capsule coriaceous or membranous, opening at the vertex between the styles. Seeds many, small, albuminous; embryo straight; radicle next the hilum.

TETRAMELES, R. Br.

Very large trees. Leaves pubescent, serrate. Flowers dicœcious. Petals O. Male fl.: Calyx-tube short; lobes 4, unequal or equal. Stamens 4, round a depressed disk; filaments elongate. Ovary rudimentary, 4-angled or O. Female fl.: Calyx-tube almost 4-angled; lobes 4, short; staminodes O. Ovary open at apex; ovules inserted in 3-4 rows on the parietal placentas; styles 4, short. Capsule membranous, open at the summit and crowned by the four styles. Seeds very many, flattened, ellipsoid; testa very lax and extending beyond the nucleus as a loose reticulated membrane.

T. nudiflora, R. Br. in Benn. Pl. Jav. Rar. 79. t. 17; Fl. Br. I. 2, 657; Bedd. Fl. Sylv. t. 212; Brandis For. Fl. 245; Gamble Ind. Timb. 381; Cooke Fl. Pres. Bomb. 1, 551. *Jermala, bondale,* K.; *Ugad, kapsin, bondsa,* M.

An immense, deciduous tree with many great, plank-buttresses at the base; young parts puberulous. Leaves broadly ovate, 4·5″-6″ by 4″-5·5″, acute or acuminate, irregularly crenate-serrate, cordate at the base, bright-green, glabrous above, pale and with reticulate and softly pubescent venation beneath; petioles 4″-6″ long, pubescent. Flowers small, dicœcious, yellowish. Male fl. ·05″ across, in erect, terminal, crowded, pubescent panicles, about 10″ long. Calyx-lobes linear-oblong, longer than the tube, glabrous. Stamens with filaments twice as long or longer than the calyx; anthers large, white. Female fl. sessile, in pendulous pubescent racemes. Calyx membranous, urceolate, 4-cleft, pubescent. Ovary faintly 8-ribbed; styles long-exserted; stigmas simple, thickened at the apex. Fruit ·2″ long, urceolate, 8-ribbed, glandular, truncate at the top; seeds minute, ellipsoid.

Sikkim and Bhutan, Burmah and Tennaserim, Western ghâts from Bombay to Ceylon; common in the rain-forests of the ghâts of North Kanara and the Konkan. An immense, deciduous tree with great wall-like, thin plank-buttresses

at the base, overtopping the regular, evergreen canopy. Fl. Feb.-Mch. Fr. April-May. Bark shining, smooth, lenticellate. Wood white, soft. Pores large, single or divided, equally distributed. Medullary rays fine to moderately broad. Weighs 24 lbs. to the cub. ft. Used in Travancore for making dug-out canoes which when rubbed with fish oil are said to last for 8 to 10 years.

Order XLVIII.—CACTACEÆ.

Herbs, shrubs or trees. Leaves reduced to tufts of spines, prickles or small tubercles. Flowers sessile, solitary, hermaphrodite, regular. Calyx-tube adnate to the ovary; lobes 3 to many, small, imbricate. Petals many, imbricate. Stamens many, free or adnate to the base of the petals. Ovary 2-celled; ovules many on parietal placentas, horizontal. Berry 1-celled, placentas pulpy; seeds numerous.

OPUNTIA, MILL.

Branches jointed; joints ovate flat, bearing tufts of unequal spines and bristles. Flowers arising from the tufts or margins of the joints, yellow or reddish. Calyx-tube adnate to but not produced beyond the ovary; lobes numerous. Petals numerous, connate at the base, spreading. Stamens indefinite, in many series. Style cylindric, thicker below, constricted at the base; stigma with 2-7, thick, erect branches. Fruit pyriform, fleshy, often with spines. Seeds with a hard testa; albumen scanty or copious.

O. Dillenii, Haw. Fl. Br. I. 2, 657; Brandis For. Fl. 245; Dalz. & Gibs. Bomb. Fl. Suppl. 39. *Prickly-pear. Nigadung, chappal-send.* Vern. Naturalized throughout the presidency in dry waste places; indigenous in S. America. Considerable sums have been expended in eradicating this noxious plant from Deccan areas. Fl. throughout the year. The species growing near Madras and along the base of the Nilghiris (*O. spinosissima,* Mill.?) appears quite distinct from the Deccan and Carnatic *O. Dillenii.*

Prickly-pear makes good hedges round Babul kurans in the Deccan and is an excellent protection for roadside trees but must be kept under control as it is likely to spread. The fruit is edible; owing however to the diffiiculty of removing the spines is not in demand. The branches without spines have been tried as a food for cattle in times of scarcity of fodder but the results were generally found to be unfavourable.

Order XLIX.—ARALIACEÆ.

Trees or shrubs, sometimes scandent. Leaves alternate, simple or compound, long-petioled; stipules adnate to the petiole or O. Flowers regular, sometimes polygamous, in umbels, racemes or panicled heads; pedicels continuous with the base of the calyx or there jointed; bracts and bracteoles small or conspicuous. Calyx-tube adnate to ovary; limb truncate, obsolete or with small teeth. Petals 5, rarely more, valvate, expanding or deciduous in a cap. Stamens as many as and alternate with the petals, inserted round an epigynous disk. Ovary inferior, 2-celled, or cells as many as the stamens; styles distinct or united; ovules solitary and pendulous in each cell. Fruit small, drupaceous or dry; seeds pendulous; albumen uniform or ruminate.

1. HEPTAPLEURUM, GÆRTN.

Trees or shrubs, sometimes climbing. Leaves alternate, digitate; leaflets coriaceous, usually entire; stipules connate within the petiole and prominent. Umbels panicled or in compound racemes; bracts woolly; pedicels not jointed; bracteoles few or O. Calyx-margin toothed or truncate. Petals 5-6 or many, valvate. Stamens as many as petals. Disk large or small, in male flowers concave. Ovary-cells as many as petals; styles small, separate or combined in a column. Fruit subglobose, 5-6-angled, often fleshy; seeds compressed; albumen uniform or more or less ruminate.

1. H. venulosum, Seem. Rev. Heder. 44; Fl. Br. I. 2, 729; Brandis For. Fl. 249; Bedd. Fl. Sylv. 122; Cooke Fl. Pres. Bomb. 1, 574; Gamble Ind. Timb. 386; *Hedera Wallichiana,* Dalz. & Gibs. Bomb. Fl. 108; *Paratropia venulosa,* W. & A. Prodr. 377. *Rawanito,* M.; *Tengar-balli, huli-pachki-balli,* K.

A straggling or climbing, glabrous shrub, sometimes epiphytic. Leaves digitately 5-7-foliate; leaflets entire, 3″-6″ by 1·5″-4·25″, coriaceous, glabrous, elliptic or elliptic-lanceolate, shortly acuminate, rounded or acute at the base; lateral-nerves about 6 pairs, strong beneath and with prominent, reticulate veins; petioles stout, terete, 6″-9″ long; petiolules stout, ·5″-2·25″ long; stipules connate between branch and petiole. Flowers yellowish-green, polygamous, in terminal branched panicles; branches numerous, sometimes 10″ long, consisting of racemose umbels; the whole forming a broad, spreading panicle, shorter than the leaves; umbels in early bud enclosed in large, woolly, caducous bracts; pedicels ·15″-·25″ long, filiform. Calyx cup-shaped, truncate. Petals 5, often cohering in a cap which is lifted off the flower by the stamens in the male flower. In the

bisexual flower the styles are short, cohering at the base into a fleshy, conical mass. Fruit globose, ·15″ in diameter, deeply 5-ridged and angled, 5-celled.

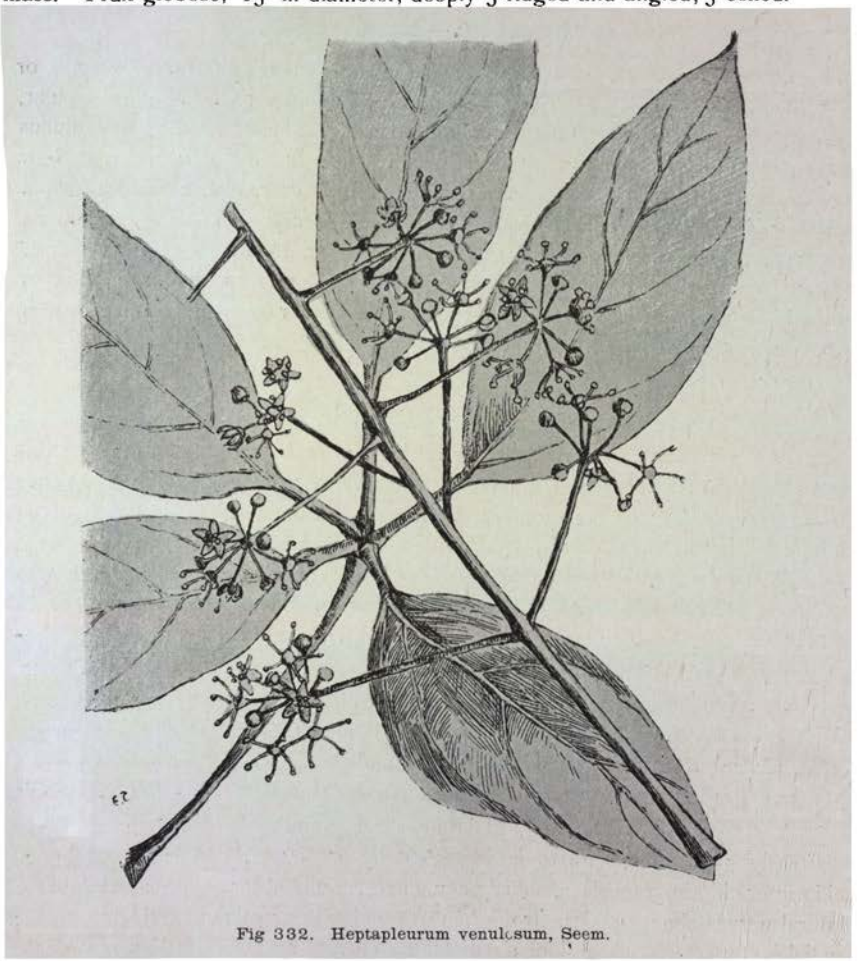

Fig 332. Heptapleurum venulosum, Seem.

Throughout tropical and sub-tropical India from the N. W. Himalayas to the South Deccan, Burmah, Assam and the Khasi Hills; common in the rain-forests of the Konkan and North Kanara. An epiphytic ornamental shrub climbing on the stems of trees by means of anchoring roots. Fl. March-June. Fr. June-Aug.

Bark grey, shining. Wood light-brown, smooth, soft. Annual-rings indistinct. Pores small, single or in short radial lines. Medullary rays fine to moderately broad, sometimes very long and somewhat far apart. Weighs 40 lbs. to the cub. ft.

Order L.—CORNACEÆ.

Shrubs or trees. Leaves opposite or alternate, often unequal at the base; stipules O. Flowers regular, hermaphrodite or unisexual, in axillary or terminal cymes, panicles or heads. Calyx-tube adnate to ovary; limb truncate or 4-5-toothed, open or valvate in bud, persistent. Petals O or 4-5. Stamens inserted with the petals and equal to them in number. Ovary inferior, 1-4-celled; crowned by the disk; style single; stigma capitate or branched; ovule solitary, pendulous. Fruit usually succulent, 1-4-celled, less often with 2 pyrenes. Seed oblong, pendulous; albumen copious, fleshy; cotyledons thin, foliaceous.

Petals long, narrow. Stamens 20-30	...	...	...	1. Alangium.
Petals short. Stamens 4-5	...	...	...	2. Mastixia.

1. ALANGIUM, LAMK.

Shrubs or small trees, armed or O. Leaves alternate, 3-nerved from the base, persistent. Flowers hermaphrodite, in axillary fascicles or condensed cymes, jointed on the pedicel. Calyx-tube adnate to the ovary; limb 5-10-toothed or truncate. Petals 5-10, linear-oblong, valvate, then reflexed. Stamens twice as many as petals or more, hairy at base. Ovary inferior, 1-celled, surmounted by a disk; style long; stigma large, capitate; ovule pendulous. Fruit a berry, crowned with the enlarged calyx-limb. Seed oblong; albumen usually fleshy; cotyledons leafy; radicle cylindric, thick.

Fig 333. Alangium Lamarkii, Thw.

A. Lamarkii, Thw. Enum. 133; Fl. Br. I. 2, 741; Dalz. & Gibs. Bomb. Fl. 109; Brandis For. Fl. 250; Bedd. Fl. Sylv. 215; Cooke Fl. Pres. Bomb. 1, 575; Gamble Ind.

Timb. 389; Brandis Ind. Trees, 354. *Ankul*, M; *Lucki, ansroli*, K. *Akaya*, Bhil.

A large deciduous, spinous shrub or small tree, often with long, scandent branches; young parts pubescent. Leaves variable, ovate-lanceolate, 3″-6″ by ·75″-2·5″, obtuse, or more or less acute and acuminate, membranous, glabrous shining above, more or less rusty pubescent beneath with saccate, hairy glands in the axils of the veins and veinules; lateral-nerves 4-6 pairs; lowest pair basal; petioles ·25″-·5″ long. Flowers white, sweet-scented, in axillary fascicles; pedicels short, bracteolate, densely pubescent, jointed at the top. Calyx shortly turbinate, silky-pubescent; lobes 6-10, triangular, very short. Petals 6-10, usually 6, linear, narrow, ·5″-·75″ long, densely pubescent outside, reflexed. Stamens about as long as the petals, usually about 20; filaments hairy at the base. Style as long as the filaments; stigma large. Fruit ovoid, globose, ·75″ long, purple, tomentose, filled with red pulp, 1-seeded crowned with the persistent calyx-limb; endocarp bony; albumen not ruminate; cotyledons foliaceous, flat with 3 basal-nerves.

Tropical India from the N. W. Himalayas to Ceylon; common throughout the presidency in dry places, often along the banks of nalas in North Kanara. Fl. Feb.-Apl. Fr. May-Aug.; sometimes at other seasons. A very variable species; a large straggling deciduous shrub or small spinous tree up to 2′ in diameter with long scandent branches. Bark smooth, grey, thin. Heartwood brown, hard, tough, close-grained, scented. Pores small, scanty in short radial lines. Medullary rays fine, closely packed. Weighs about 50 lbs. to the cub. ft. A valuable fuel. Used for pestles to crush oilseeds, inlaying and carving work. Fruit astringent, acid, edible. An oil is extracted from the seeds.

2. MASTIXIA, Blume.

Trees with resin-canals in the pith. Leaves alternate or opposite, entire. Flowers hermaphrodite, 2-bracteolate, in terminal panicles; pedicels jointed under the flower. Calyx-tube campanulate pubescent; limb 4-5-toothed. Petals 4-5, ovate, valvate, silky. Stamens 5-4. Disk large, fleshy. Ovary 1-celled; ovule 1, pendulous. Drupe ovoid, areolate at the top, crowned by the calyx teeth; putamen grooved; endocrap protruded inwards down one side. Seeds ellipsoid; albumen fleshy.

M. pentandra, Blume Mus. Bot. 1, 256; Fl. Br. I. 2, 746; Cooke Fl. Pres. Bomb. 1, 576; Gamble Ind. Timb. 391. *Bursinopetalum arboreum,* Dalz. & Gibs. Bomb. Fl. 28.

A medium-sized or large, evergreen tree. Leaves elliptic-oblong, 3″-6″ by 1·5″-3, obtuse or shortly acuminate, narrowed into the petiole at the base, dark-green, glabrous above, pale beneath, coriaceous; base sometimes unequal-sided;

lateral-nerves about 6 pairs strong and prominent beneath; petioles ·5″-1·5″ long. Flowers green in dense terminal pubescent panicles, shorter than the leaves, often in the axils of small narrow, leafy ·75″ long bracts; upper bracts linear, ·25″ long; bracteoles about ·1″ long, acute, rusty-pubescent. Calyx-tube campanulate, about ·1″ long, pubescent outside; teeth shorter than the tube, broadly triangular, acute. Petals 5, ovate, thick, longer than the calyx. Stamens 5. Style very short. Fruit ellipsoid, narrowed towards the truncate top, about 1″ long, crowned with the calyx-tube and widely separated calyx-teeth. Possibly identical with *M. arborea*, C. B. C.; Bedd. Fl. Sylv. t. 216, from which it apparently differs only in the size of the bracts, a variable character.

Western ghâts from Bombay southwards. Konkan and North Kanara in rain-forest; also along nalas in North Kanara but nowhere abundant. "Dharwar," Dalz. Fl. Jan.-Mar. Fr. May. A moderate-sized tree with smooth bark. Wood greenish-grey, soft. Weighs 28 lbs. to the cub. ft. Pores small, evenly distributed. Medullary rays fine, numerous.

Order LI.—RUBIACEÆ.

Trees, shrubs or herbs, erect or climbing, sometimes spinous. Leaves opposite or whorled, entire; stipules various, inter or intrapetiolar, free or connate. Flowers hermaphrodite, rarely unisexual, usually regular. Inflorescence various. Calyx-tube adnate to the ovary; limb entire or toothed. Corolla gamopetalous, usually 4-5-lobed; lobes imbricate, contorted or valvate. Stamens as many as corolla-lobes, alternating with them; anthers 2-celled. Ovary inferior, 2-or more-celled, rarely 1-celled. Fruit berried, capsular or drupaceous or of dehiscent or indehiscent, 2-10-celled cocci. Seeds with a fleshy or horny albumen; cotyledons flat or semi-terete; radicle superior or inferior.

A large forest Order containing many important indigenous timber trees and shrubs as well as introduced ornamental or economically valuable plants. *(Gardenia, Coffea, Cinchona, Cephælis, Ipecacuanha,* etc.) In the *Rubiaceæ* there are no difficult genera and the species are usually easily distinguished from each other.

Seeds numerous. (Except in some species of *Webera* and in *Diplospora*).

Flowers collected into dense, globose heads.
- Ovaries confluent.
  - Corolla-lobes imbricate ... ... 1. Sarcocephalus.
- Ovaries free or nearly so.
  - Corolla-lobes valvate.
    - Leaves cordate. Calyx 5-lobed ... ... 2. Adina.
    - Leaves ovate or obovate. Calyx truncate ... 3. Stephegyne.
  - Corolla-lobes imbricate.
    - Stigma fusiform ... ... 4. Anthocephalus.
    - Stigma globose ... ... 5. Nauclea.

Flowers in leafy, bracteate, panicled spikes.
- Corolla-lobes valvate. Fruit capsular; seeds winged ... ... 6. Hymenodictyon.

Flowers simply panicled.
- Corolla-lobes twisted in bud. Fruit capsular; seeds angled, not winged ... ... 7. Wendlandia.

Flowers panicled or corymbose.
- Calyx with 1 large coloured leafy lobe. Corolla-lobes valvate in bud. Fruit indehiscent, fleshy ... ... 8. Mussænda.

Flowers in terminal, corymbiform cymes.
Corolla-lobes twisted in bud. Fruit a 1-many-seeded berry ... ... 9. Webera.

Flowers in axillary cymes, solitary or fascicled.
Corolla-lobes 5, twisted in bud. Stigma fusiform.
Ovary 2-celled; seeds numerous ... ... 10. Randia.

Corolla-lobes 5-12, twisted in bud. Stigma fusiform.
Ovary 1-celled; seeds numerous ... ... 11. Gardenia.

Corolla-lobes 5, twisted in bud. Ovary usually 2-celled; style-branches linear or oblong.
Berry few-seeded ... ... 12. Diplospora.

Seeds few, 2-5.

Flowers axillary, fascicled or in peduncled corymbose cymes.
Corolla-lobes valvate in bud.
Fruit a 2-seeded drupe with 2 pyrenes or a 2-celled putamen ... ... 13. Canthium.
Fruit a 5-seeded drupe with 5 pyrenes ... 14. Vangueria.

Flowers in trichotomous panicles.
Corolla-lobes twisted in bud.
Style short-exserted, 2-fid. Fruit with 2 plano-convex, usually ventrally concave, coriaceous pyrenes ... ... 15. Ixora.

Style long-exserted, undivided. Fruit with 2 dorsally compressed, ventrally concave, coriaceous pyrenes ... ... 16. Pavetta.

Flowers in axillary fascicles.
Corolla-lobes twisted in bud. Fruit with 2 plano-convex, ventrally-grooved, coriaceous pyrenes ... ... 17. Coffea.

Flowers sessile on a globose receptacle.
Corolla-lobes valvate in bud. Fruit a fleshy syncarpium of 1-seeded pyrenes ... ... 18. Morinda.

Flowers in terminal, corymbose or panicled, rarely capitate cymes.
Corolla-lobes valvate in bud.
Corolla-tube short, straight. Drupe of 2 pyrenes, not concave ... ... 19. Psychotria.

Corolla-tube long, curved. Drupe with 2 dorsally compressed, ventrally concave pyrenes — 20. Chasalia.

Flowers in axillary, bracteate clusters or axillary and terminal, solitary or few.

Corolla-lobes valvate in bud.

Style-arms or stigmas 3-9. Drupes with 4-9, 1-seeded, triquetrous pyrenes ... ... — 21. Lasianthus.

Style filiform with 2 short arms. Fruit with 1-2, crustaceous pyrenes ... ... — 22. Saprosma.

Flowers in trichotomous panicles.

Corolla-lobes valvate in bud. Style 5-fid.

Fruit a capsule 5-valved at top, 5-seeded ... — 23. Hamiltonia.

1. SARCOCEPHALUS, AFZEL.

Shrubs or trees. Leaves simple, entire; stipules intrapetiolar and persistent or interpetiolar and caducous. Flowers in globose, bracteate, terminal, pedunculate heads; bracteoles 0. Calyx-tubes and ovaries confluent; lobes 4-5, unequal, glabrous or pubescent. Stamens inserted on the mouth of the corolla-tube. Ovary 2-celled; ovules numerous, imbricate on pendulous placentas; style long exserted; stigma fusiform. Fruit a fleshy, globose mass of 2-celled pyrenes with thin septa; seeds few in each cell; testa crustaceous, not winged; albumen fleshy.

S. missionis, Haviland in Jour. Linn. Soc. 33, 32; Cooke Fl. Pres. Bomb. 1, 578; *Nauclea missionis,* Wall.; Fl. Br. I. 3, 27; Talb. Trees Bomb. 186; Gamble Ind. Timb. 405; *N. elliptica,* Dalz. & Gibs. Bomb. Fl. 118. (not of Bedd.)

A medium-sized tree. Leaves ovate-lanceolate, 2·5″-6″ by 1″-1·75″, subobtuse at the apex and narrowed into the short, often winged petiole at the base, glabrous, membranous, shining above, paler beneath; lateral-nerves about 10 pairs, slender; petioles about ·25″ long; stipules intrapetiolar, persistent, sheathing. Flowers in short-peduncled, yellow heads, about 1·5″ in diameter; peduncles about ·5″ long, with several pairs of glabrous, acute, sheathing bracts at the base. Calyx-lobes about ·12″ long, thickened and obtuse at the apex, silky-hairy on both sides. Corolla-tube glabrous, ·25″ long; lobes imbricate, about ⅓ the length of the tube, obtuse and silky-hairy at the apex on both sides. Anthers large, yellow, apiculate. Style long-exserted; stigma fusiform. Fruits connate into a globose mass; seeds arillate, flattened, imbricate; testa black.

Southern districts of the Western peninsula from N. Kanara to Travancore; common along the banks of rivers and watercourses in several localities near

Yellapore, Sircy and Karwar in the N. Kanara district. Fl. Apl.-May. Fr. R. S.

A small evergreen tree, ornamental when in flower. Bark smooth, dark-coloured. Wood yellowish, soft to moderately hard. Pores small, often subdivided. Medullary rays fine, numerous, wavy; weighs about 35 lbs. to the cub. ft.

2. ADINA, SALISB.

Trees or shrubs. Leaves opposite with large deciduous, interpetiolar stipules. Flowers bracteate, in solitary or panicled, globose heads. Receptacle pilose. Calyx-tube angled; lobes 5. Corolla-tube elongate; lobes 5. Stamens 5, on mouth of corolla; filaments short. Disk cup-shaped. Capsule of 2, dehiscent cocci, many-seeded. Seeds oblong with a winged testa; albumen copious.

A. cordifolia, Hook. f. in Gen. Plant. II, 30; Fl. Br. I. 3, 24; Brandis For. Fl. 263; Cooke Fl. Pres. Bomb. 1, 581; Gamble Ind. Timb. 401; *Nauclea cordifolia,* Bedd. Fl. Sylv. t. 33; Dalz. & Gibs. Bomb. Fl. 118. *Heddi, honangi, hedu,* M.; *Yettagal, arun-santigi,* K.; *Haladwan.* Guz.

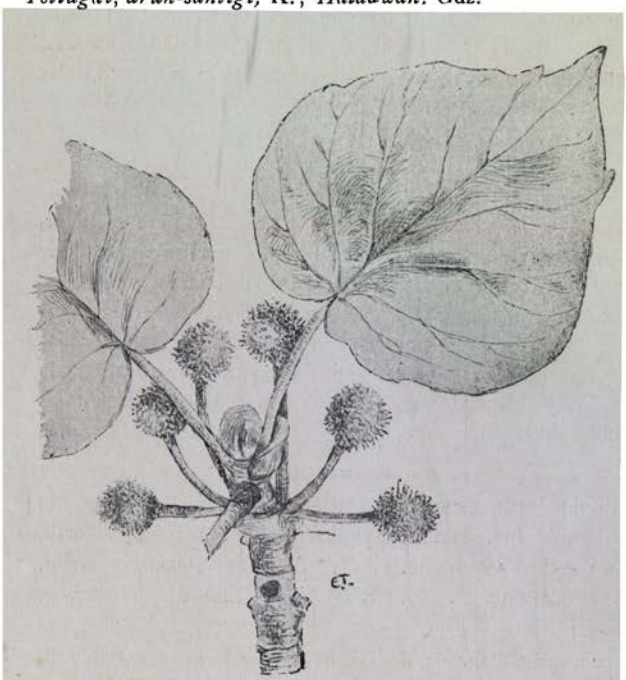

Fig 334. Adina cordifolia, Hook.

A large, deciduous tree with horizontal branches; young parts pubescent. Leaves cordate-orbicular, or obovate, 4″-8″ in diameter and usually nearly as long, shortly acuminate, glabrous or slightly pubescent above particularly on the nerves and more or less densely pubescent beneath; lateral-nerves about 8 pairs, the lowest pair basal; petioles 1″-4″ long, pubescent; stipules ·5″-·75″ long, broad, obtuse, pubescent, closely covering the uppermost pair of leaf buds. Heads of

flowers yellow, about 1″ in diameter, 1-3 axillary, fascicled; rarely with more than one head of flowers; peduncles 2″-4″ long, stout. Receptacle and linear bracteoles hairy. Calyx-tube very short, 5-angled, hairy; lobes 5, club-shaped, deciduous. Corolla ·25″ long; tube slender, tomentose, slightly dilated above; lobes subacute, recurved. Style long-exserted; stigma clavate. Fruit-head consisting of many-seeded, small, cuneate, distinct, 2-valved, pilose capsules; seeds winged at both ends; axis of capsule persistent, thin, linear, 1-nerved.

Deciduous forests of tropical India; Sub-Himalayan tract from the Jumna eastwards, ascending to 3000′, Burmah and dry region of Ceylon; common throughout the presidency in monsoon-forests; sometimes gregarious in suitable localities but generally a scattered tree in deciduous forests. Fl. June-July. Fr. Dec.-Mch.

A large, deciduous tree. Bark grey, soft, smooth, with great horizontal wrinkles, exfoliating in thick scales; inner-bark mottled-red, ·5″-·75″ thick. Wood yellow, moderately hard, evengrained and durable but is liable to crack in seasoning; no heartwood. Pores small, very numerous. Medullary rays fine, very numerous, uniform, and close together. Annual-rings indistinct. Weighs about 42 lbs. to the cub. ft. Much used for house-construction, gun-stocks, canoes, furniture, agricultural implements, cigar-boxes, combs, &c. and in Northern India for turning. A well known, valuable and useful timber.

3. STEPHEGYNE, KORTH.

Shrubs or trees with opposite, petioled leaves; stipules large, interpetiolar, caducous. Flower-heads globose, solitary or paniculate often subumbelled, usually subtended by two large bracts. Flowers surrounded with paleaceous bracteoles. Calyx-tube short; limb truncate or 5-toothed. Corolla funnel-shaped; tube long; throat hairy. Stamens 5; filaments short, inserted in the mouth of the corolla-tube; anthers lanceolate, apiculate at the base. Disk annular. Ovary 2-celled; style exserted, filiform; stigma mitriform; ovules numerous on pendulous placentas. Fruit of 2 dehiscent cocci, many-seeded. Seeds small; testa winged; albumen fleshy.

S. parvifolia, Korth. in Verh. Gesch. Nat. Bot. 161; Fl. Br. I. 3, 25; Brandis For. Fl. 262; Gamble Ind. Timb. 403; *Mitragyna parvifolia*, Korth. Obs. Naucl. Ind. 19; Cooke Fl. Pres. Bomb. 1, 58; *Nauclea parvifolia*, Bedd. Fl. Sylv. t. 34; Dalz. & Gibs. Bomb. Fl. 118. *Kalamb, kaddam*, M.; *Kadawar, kanu, yetega, kudwal*, K.

A large pubescent or almost glabrous, deciduous tree. Leaves variable in shape and size, 2″-6″ by ·75″-3″, suborbicular, ovate or obovate, obtuse, acute or bluntly acuminate at the apex, rounded or acute at the base, dark-green above,

paler beneath, glabrous on both sides; lateral-nerves 6-8 pairs, often with axillary, hairy glands; petioles ·25″-·75″ long; stipules oblong, obtuse, parallel-nerved, pink or pale-coloured. Flower-heads pale-yellow, or nearly white, sweet scented, ·75″ in diameter; peduncles solitary, terminal, about ·25″ long; bracteoles spatulate, very small. Calyx usually with a pair of large, leafy bracts at the base. Calyx about ·12″ long; lobes acute, valvate. Corolla about ·25″ long, glabrous; lobes about ·1″ long, acute, valvate. Style white, much exserted; stigma mitriform with a concave base. Heads of fruits about ·6″ in diameter, consisting of small, 10-bluntly-ribbed, oblong capsules.

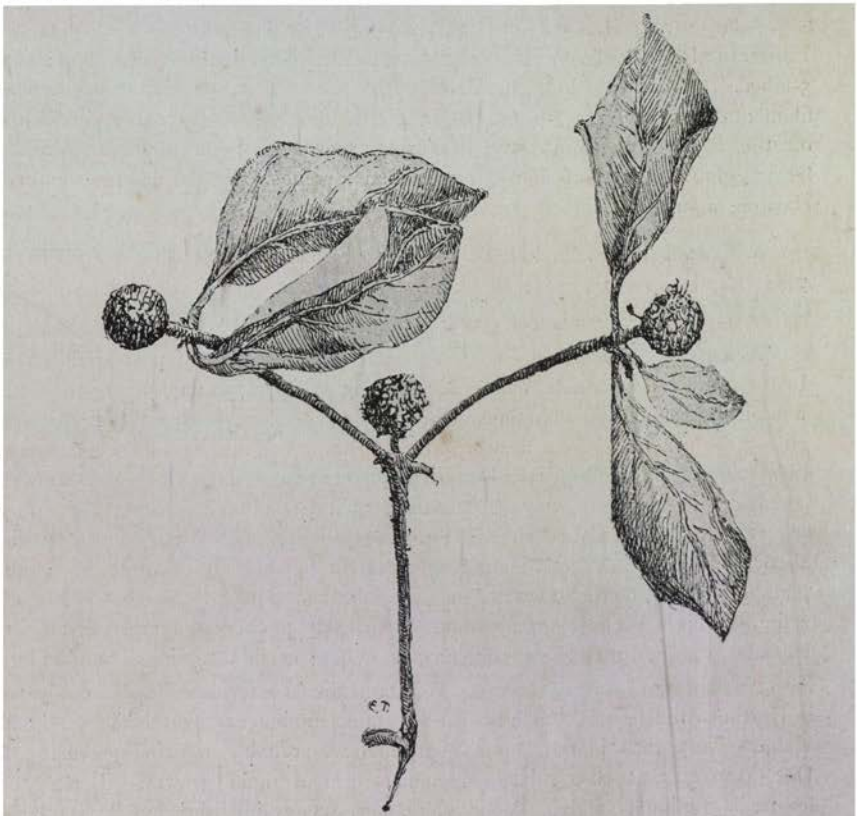

Fig 335. Stephegyne parvifolia, Korth.

Throughout tropical India, Burmah and Ceylon in deciduous forests. Fl. May-July. Fr. Nov.-Dec. A large deciduous tree. Bark light-grey, smooth, exfoliating in irregular scales which leave shallow depressions. Wood light

pinkish-brown, moderately hard, close-grained, smooth. Annual-rings more or less distinct. Pores small, numerous. Medullary rays fine, very numerous, varying in width. Weighs about 45 lbs. to the cub. ft. The timber is similar in appearance to that of *Adina cordifolia,* but quite distinct in colour, is durable if not exposed to damp; takes a good polish and is easy to work; used for furniture, agricultural implements, carving, house building purposes, turning, &c.

4. ANTHOCEPHALUS, A. RICH.

A large tree. Leaves opposite, coriaceous; interpetiolar stipules caducous. Flowers in large, globose, ebracteolate heads. Calyx-tubes not confluent; limb 5-lobed. Corolla-tube long, funnel-shaped. Stamens 5, on throat of corolla; filaments short. Ovary 2-celled below, 4-celled above; ovules many, horizontal on the 2 bifid placentas; style filiform, exserted; stigma fusiform. Fruit a fleshy, globose mass of many, few-seeded pyrenes. Seeds minute; embryo clavate; albumen fleshy.

A. Cadamba, Miq. Fl. Ind. Bat. II, 135; Fl. Br. I. 3, 23; Gamble Ind. Timb. 400; Brandis For. Fl. 261; Bedd. Fl. Sylv. 127. t. 35; *A. indicus,* A. Rich.; Cooke Fl. Pres. Bomb. 1, 579. *Kaddam, nhyu,* Vern.; *Kadwal,* K.

A large, deciduous tree with horizontal branches; young parts pubescent. Leaves coriaceous, broadly ovate, decussate, 3″-7″ by 1·75″-4·25″, acute or shortly acuminate, rounded or sometimes subcordate at the base, glabrous, shining above, pubescent beneath; lateral-nerves about 10 pairs, prominent on both sides, looping within the margin; petioles ·5″-1″ long; stipules lanceolate, early caducous. Flower-heads 1·5″ in diameter, yellow, solitary, terminal; peduncles stout, ·5″-1″ long; bracts stipuliform. Calyx-lobes ·2″ long, erect, linear, obtuse, hairy on the outside about the middle. Corolla-lobes lanceolate, acute, erect, imbricate in bud; tube ·4″ long, slender, dilated upwards, slightly pubescent outside. Styles and stigmas white. Fruit a globose, orange mass of closely packed, compressed, angular capsules, crowned with the persistent calyx-lobes; seeds not winged, muriculate.

Northern and Eastern Bengal, Pegu and the Western peninsula, cultivated in Northern India; on the bunds of a few tanks and near several villages in N. Kanara; very rare in the Bombay presidency, probably not indigenous. Fl. Dec.-Mch. Fr. R. S. A large deciduous tree of rapid growth. Bark grey, fissured; rhytidome scaly. Wood white, soft, evengrained, brittle. Pores large and subdivided. Medullary rays fine, numerous and close. Weighs about 40 lbs. to the cub. ft. Used for building purposes and makes excellent tea-boxes. Gamble places it first on the list of tea-box timbers on account of its reaching useful size in a very short time.

5. NAUCLEA, L.

Trees or shrubs. Leaves opposite, large, sessile or petioled; stipules interpetiolar, large, caducous. Flowers pentamerous, crowded in globose, solitary or ternate, peduncled, bracteate heads; bracteoles O or setiform, intermixed with the flowers. Calyx-tube turbinate or obconic; lobes deciduous. Corolla-tube elongate; lobes imbricate. Stamens 5, on throat of corolla. Ovaries not confluent, 2-celled; ovules numerous on pendulous placentas; style long; stigma globose. Fruit of 2, dehiscent, many-seeded cocci. Seeds imbricate; testa winged.

N. purpurea, Roxb. Fl. Ind. 1, 515; Fl. Br. I. 3, 26; Bedd. Fl. Sylv. 129; Cooke Fl. Pres. Bomb. 1, 580; Brandis Ind. Trees. 368; *N. elliptica,* Dalz. & Gibs. Bomb. Fl. 118; Bedd. For. Man. t. 29; Ic. Pl. Ind. Or. t. 19. *Phuga, biloor,* M.

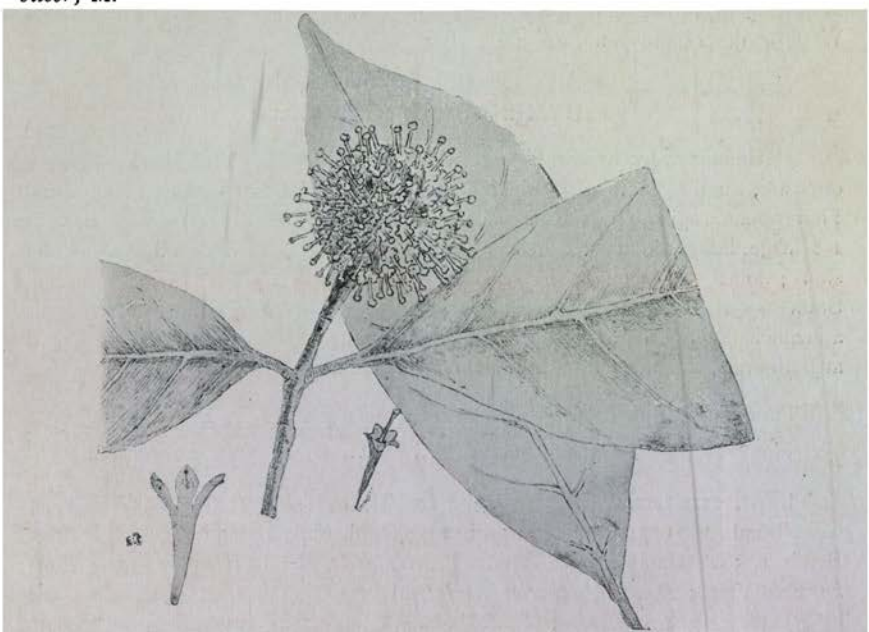

Fig 336. Nauclea purpurea, Roxb.

A medium-sized, glabrous tree. Leaves elliptic, obovate, membranous, 3″-6″ by 1·25″-2·25″, acute or acuminate at the apex, narrowed and sometimes unequal-sided at the base; lateral-nerves about 10 pairs, strong beneath; petioles ·25″-·5″ long; stipules early caducous. Flower-heads yellowish-purple, about 1″ in

diameter; peduncles terminal, solitary, 1″-2″ long, much thickened at the top, furnished with 2 very early caducous bracts about the middle. Flowers mixed with numerous slender spathulate, pubescent bracteoles. Calyx about ·15″ long; teeth subulate, white hairy. Corolla-tube slender, ·3″ long, slightly dilated upwards, glabrous; lobes short, obovate, acute, usually glabrous and dorsally keeled. Anthers included, apiculate. Style exserted about ·2″ beyond the mouth of the corolla; stigma globose. Fruit crowned with the persistent calyx-lobes.

Western peninsula from the Konkan southwards, N. Circars in the Rumpa hills; on the Supa ghâts of N. Kanara along streams and water-courses. Fl. Feb.-Mch. Fr. May-June.

A small or moderate-sized tree, 50′ high and up to 2·5′ in diameter. Bark grey, exfoliating in scales like those of *Adina cordifolia* but smaller; inner-bark yellow, fibrous, rapidly turning black on exposure to the air. Wood yellow, smooth, moderately hard. Pores small, equally distributed, sometimes filled with resin. Medullary rays fine, short, wavy, closely packed. Weighs 46 lbs. to the cub. ft. Would make a handsome furniture timber.

6. HYMENODICTIYON, WALL.

Deciduous trees or shrubs with thick branches and bitter bark. Leaves opposite, simple, petioled. Stipules interpetiolar, glandular-serrate, deciduous. Flowers small, spikate; spikes in axillary and terminal, often drooping panicles with 1-2, large, leafy, reticulate, persistent bracts; bracteoles small or O. Calyx-tube short; lobes 5-6, deciduous. Corolla funnel-shaped; lobes 5, short, valvate. Stamens 5. Ovary 2-celled; ovules numerous; stigma spindle-shaped. Fruit a loculicidally dehiscent capsule. Seeds numerous, imbricating upwards, winged at both ends, the lower wing bifid; embryo small in a fleshy albumen.

Flowers pedicelled. Capsules on recurved pedicels	1. H. excelsum
Flowers sessile. Capsules erect	2. H. obovatum.

1. H. excelsum, Wall.; Roxb. Fl. Ind. II, 149; Fl. Br. I. 3, 35; Dalz. & Gibs. Bomb. Fl. 117; Brandis For. Fl. 267; Bedd. Fl. Sylv. 130; Cooke Fl. Pres. Bomb. 1, 582; Gamble Ind. Timb. 406; *H. utile*, Bedd. Fl. Sylv. 130. *Kala-kurwah,* Vern.; *Dondru, dancelo, bhorsal,* M.

A large, deciduous tree. Leaves ovate-elliptic, 7″-9″ by 3·5″-4·5″, shortly acuminate, narrowed into the petiole at the base which is sometimes slightly unequal-sided, membranous, pubescent on both sides, principally on the nerves; lateral-nerves about 8 pairs, conspicuous; petioles 2″-3″ long; stipules broad, oblong, recurved. Flowers white, fragrant, pedicelled, in dense cylindrical leafy bracteate spikes, arranged in terminal drooping panicles; leafy bracts smaller

than the leaves, coloured and bullate, usually with long petioles. Calyx urceolate, about ·1″ long, tomentose; teeth short, triangular, acute. Corolla-tube slender, twice as long as the calyx, tomentose outside; lobes shorter than the tube, linear-acute. Filaments short, attached to the back of a broad connective; anthers acute. Styles long-exserted. Fruit an ovoid, 2-valved capsule about ·75″ long; pedicels about ·25″ long, stout, recurved.

Dry hills at the base of the Himalayas from the Ravi eastwards, Behar, Central provinces, Southern and Western India in deciduous forests; throughout the ghâts of the Deccan and Konkan, Panch Mahals. Fl. June-July. Fr. Oct.

A conspicuous tree when in fruit usually found sparsely distributed in deciduous monsoon-forest, sometimes along river-banks.

Bark thick, soft, grey-coloured, exfoliating in irregularly shaped scales; inner-bark very bitter. Wood white, turning brownish-grey, soft. Annual-rings indistinct. Pores moderate-sized, scanty. Medullary rays few, broad, alternating with fine wavy rays giving a silver-grain on a radial section. Weighs about 30 lbs. to the cub. ft.

The wood is used for toys, sword-scabbards, palanquins, packing-cases and would be suitable for tea-boxes. The bark yields an alkaloid which serves in native medicine as a substitute for quinine.

Fig 337. Hymenodictiyon obovatum, Wall.

2. H. obovatum, Wall., in Roxb. Fl. Ind. II, 153; Fl. Br. I. 3, 36; Dalz. & Gibs. Bomb. Fl. 17; Bedd. Fl. Sylv. 219; Brandis For. Fl. 268; Cooke Fl. Pres. Bomb. 1, 583; Gamble Ind. Timb. 407. *Kurwei, sirid,* Vern.; *Bogi, hiremara,* K.

A large, deciduous tree. Leaves crowded at the ends of the branchlets, broadly obovate, 2·5″-4″ by 1·75″-2·25″, abruptly acuminate at the apex and

narrowed into the petiole at the base, membranous, glabrous above, pubescent on the nerves beneath; lateral-nerves 6-8 pairs, distinct and with a conspicuous reticulate venation beneath; petioles 1″-2·5″ long; stipules obovate-oblong with glandular serrated margins, early caducous. Flowers small, greenish-white, in dense cylindric, shortly panicled spikes, with 2 small, linear, subulate bracts at the base; bracteate leaves lanceolate, cream-coloured, reticulately veined and pubescent beneath, slightly bullate above. Calyx-tube short, pubescent; teeth triangular acute, ciliate on the margins. Corolla about 1″ long; tube very short; limb broadly campanulate, more or less glabrous outside; lobes ovate, acute or obtuse. Stamens connate at the base. Ovary hairy. Capsule ovoid, rough, longitudinally wrinkled, ·5″ long, on a very short, erect pedicel.

Western peninsula from Bombay to Travancore; throughout the monsoon-forests of the Konkan and North Kanara. Fl. Aug.-Sept. Fr. Nov.-Dec. There are two varieties of this species, one with large obovate pubescent leaves and capsules 1″ long; the other with small ovate, nearly glabrous leaves and capsules, ·5″ long.

A moderate-sized tree. Bark grey, shining, scaly, brown within; inner-bark white with yellowish bands of soft tissue. Wood grey, soft. Annual-rings indehiscent. Pores small, often in pairs. Medullary rays fine, short and not close together. Weighs about 36 lbs. to the cub. ft. Bark contains bitter alkaloids like quinine.

7. WENDLANDIA, BARTL.

Shrubs or small trees. Leaves opposite or ternately whorled; stipules interpetiolar, entire or 2-fid. Flowers small, white or rose-coloured, in terminal panicled cymes, 2-3-bracteolate. Calyx-tube subglobose; lobes 4-5, sub-equal, small. Corolla tubular or funnel-shaped; lobes imbricate in bud. Stamens 4-5, inserted between corolla-lobes; filaments O or elongate. Ovary 2-celled; style filiform; stigma entire or bifid. Capsule small, dehiscent, many-seeded. Seeds minute, horizontal compressed, obscurely winged; albumen fleshy; embryo short, cylindric.

Leaves opposite. Stipules caducous	1. W. exserta.
Leaves whorled in threes. Stipules persistent ...	2. W. Notoniana.

1. **W. exserta,** DC. Prodr. IV, 411; Fl. Br. I. 3, 37; Brandis For. Fl. 268; Bedd. Fl. Sylv. 130; Cooke Fl. Pres. Bomb. 1, 584; Gamble Ind. Timb. 408; *Padgira,* M.

A small deciduous tree; branches softly tomentose. Leaves coriaceous, entire, 3″-8″ by 1·5″-4″, ovate or ovate-lanceolate, acute at the apex, narrowed into the petiole and sometimes unequal-sided at the base, glabrous above, grey

tomentose beneath; lateral-nerves about 12 pairs, arching upwards, prominent beneath; stipules broad, triangular, ovate, tomentose, the upper half recurved; petioles about 1″ long, softly grey-tomentose. Flowers small, white, nearly sessile, fragrant, in terminal pyramidal panicles 6″-10″ long; bracteoles linear-lanceolate, hairy. Calyx ·1″ long, densely white-hairy; tube globose; lobes 5, triangular, obtuse. Corolla white; tube short; lobes ovate-oblong, acute, as long as the calyx, reflexed veined and glabrous within. Stamens exserted, with large versatile anthers as long as the filaments. Style bifid about half way down but lobes often adhering and apparently club-shaped. Capsule globose about ·1″ in diameter, white pubescent; seeds minute, black; testa obscurely winged.

Fig 338. Wendlandia Notoniana, Wall.

Dry forests of the tropical Himalaya, Orissa and Central India; in the deciduous forests of the North Deccan; common on the Nasik ghàts near Rajur where it appears to be gregarious in places; absent from N. Kanara. Fl. Feb.-Apl. Fr. May-June. **A** handsome tree with large panicles of sweet-smelling, white flowers. Bark brown, rough. Wood reddish-brown, hard, close-grained. Pores small, evenly distributed. Medullary rays broad and fine. Annual-rings distinct. Used for building purposes and agricultural implements.

2. W. Notoniana, Wall., in W. & A. Prodr. 403; Fl. Br. I. 3, 40; Dalz. & Gibs. 117; Bedd. Fl. Sylv. t. 224; Cooke Fl. Pres. Bomb. 1, 584; Gamble Ind. Timb. 409. *Showla, talung, parwi,* M.; *Taligi, thilge,* K.

A small tree; branches pubescent. Leaves usually in verticels of 3, elliptic-lanceolate, 2·5″-4·5″ by 1·25″-2″, acute or acuminate, narrowed into the petiole at the base, coriaceous, glabrous above, pubescent beneath; lateral-nerves about 8

pairs, prominent and coloured in the young leaves; petioles ·25″-·5″ long; stipules variable, usually recurved and often bifid, persistent for some time after the fall of the leaf. Flowers fragrant, in dense, terminal, pubescent, pyramidal panicles 6″-12″ long. Calyx globose, very small, pubescent; teeth as long as the tube. Corolla-tube glabrous outside, hairy within, slender, ·2″ long; lobes shorter than the tube, reflexed, not veined. Filaments not exserted. Style shortly bifid. Capsules globose, ·1″ in diameter, pubescent, crowned with the persistent calyx-lobes.

Western and Southern India and Ceylon; Nilghiris up to 8000′; in the moist forests of the Konkan and North Canara, very common on the Supa ghâts also at Mahableshwar at 4500′ along the borders of streams growing on laterite. Fl. Jan.-Feb. Fr. Apl. A small tree with an ornamental and scented inflorescence. Wood reddish. Annual-rings visible. Pores small, numerous. Medullary rays fine and moderately broad, numerous. Weighs about 44 lbs. to the cub. ft. Wood similar in structure to that of *W. exserta.*

8. MUSSÆNDA, L.

Shrubs. Leaves simple, sessile or petioled; stipules solitary or twin, interpetiolar, deciduous. Flowers yellow, in terminal cymes; bracts and bracteoles deciduous. Calyx-lobes 5, 1 frequently developed into a white or coloured leaf. Corolla tubular with a villous throat; lobes 5, valvate in bud. Stamens 5. Ovary 2-celled; ovules numerous on peltate, fleshy placentas. Berry fleshy, areolate at the top, many-seeded. Seeds minute; testa pitted.

M. frondosa, Linn. DC. Prodr. IV, 370; Fl. Br. I. 3, 89; Dalz. & Gibs. Bomb. Fl. 111; Bedd. Fl Sylv. 131; Cooke Fl. Pres. Bomb. 1, 597; Gamble Ind. Timb. 410. *Bhutkes, lavasat, sherwod,* M.; *Bebana,* Vern.; *Billoothi, pathri, hasthy-gidda,* K.; *Daspathry,* Kon.

A large shrub with rambling sometimes climbing, more or less adpressed hairy branches. Leaves broadly ovate, 2″-5″ by 1·2″-3·5″, shortly acuminate, narrowed into the petiole at the base, membranous, more or less pubescent above and on the nervation beneath; lateral-nerves about 10 pairs distinct on both sides; petioles ·25″-1″ long. Cymes terminal, softly silky-hairy; peduncles stout, hairy; pedicels short; buds clavate, 5-angled; bracteoles subulate. Calyx-lobes lanceolate, about ·5″ long, the enlarged lobe only developed on the outer side of a few flowers, large, creamy-white, conspicuous, leaf-like, persistent, about as large as the foliage leaf, ovate, acuminate, nearly glabrous when mature, 5-7-basal-nerved; petioles ·5″-1″ long. Corolla 1″-1·5″ long, orange, pubescent or hairy; tube slender, densely hairy at the mouth; lobes acute or acuminate, ·25″ long, pubescent outside. Fruit subglobose or ovoid, ·5″ in diameter, black, glabrous, with many minute, black, pitted seeds immersed in reddish, spongy placental tissue.

North-east Himalayas, Bengal, Southern and Western India and Ceylon; often cultivated in gardens. Throughout the moist monsoon and rain-forests of North Kanara and the Konkan where there is a heavy rainfall. Fl. & Fr. Aug.

A handsome ornamental erect or climbing shrub. Bark grey, smooth, granular. Wood grey, soft, smooth. Annual-rings distinct. Pores small, a line of them to mark the annual-ring, otherwise equally distributed. Medullary rays fine or very fine, numerous. Weighs 36 lbs. to the cub. ft.

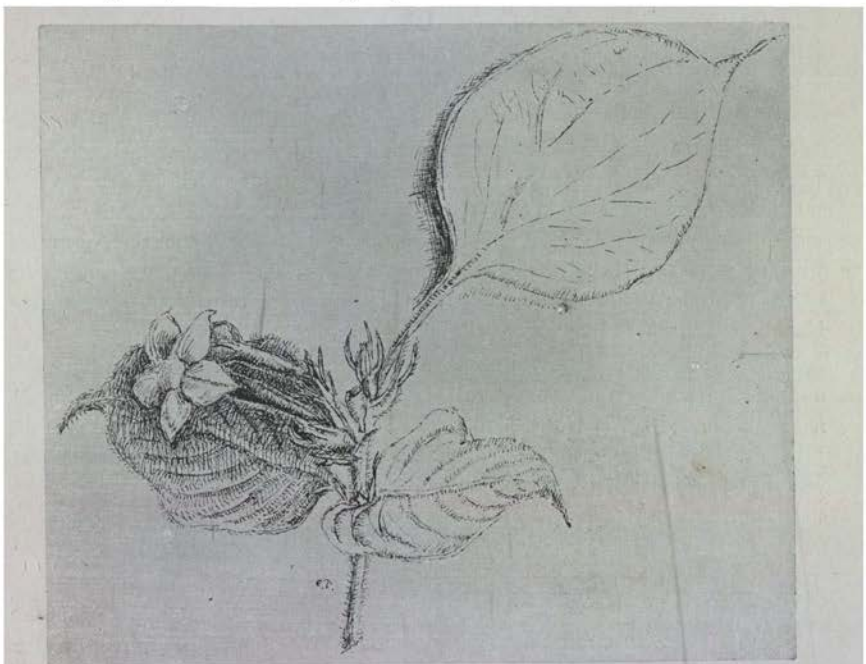

Fig 339. Mussænda frondosa, Linn.

9. WEBERA, SCHREB.

Trees or shrubs. Leaves entire, glabrous; stipules deciduous. Flowers in terminal, corymbose cymes. Calyx-tube ovoid or turbinate; limb short, 4-5-partite. Corolla-tube cylindrical; lobes 5, spreading or reflexed, imbricate and usually twisted in bud. Ovary 2-celled; style short; stigma long and spindle-shaped, grooved, usually far exserted; ovules 2 or more in each cell on fleshy, peltate placentas. Berry glabrous, 2-celled, cells 1-many-seeded. Seeds plano-convex or cupped, rarely angled; albumen fleshy or horny; embryo small; cotyledons leafy; radicle pointing variously.

W. corymbosa, Willd.; Roxb. Fl. Ind. 1, 696; Fl. Br. I. 3, 102; Gamble Ind. Timb. 411; Brandis Ind. Trees, 377; *W. asiatica,* Bedd. Fl. Sylv. 133; *Tarenna zeylanica,* Gaertn. Fruct. 1, 139, t. 28; Cooke Fl. Pres. Bomb. 1, 598; *Stylocoryne Webera,* A. Rich.; Dalz. & Gibs. Bomb. Fl. 119. *Kare,* M.

A large, evergreen shrub or small tree; young shoots glabrous and more or less covered with shining resin. Leaves drying black, coriaceous, oblong-lanceolate, 2·5″-7″ by ·75″-1·75″, acute or acuminate at the apex, narrowed into the petiole at the base, hard, shining above, paler beneath; lateral-nerves about 15 pairs, prominent beneath; petioles ·25″-·5″ long, stout; stipules interpetiolar, acute or acuminate from a broad base, covered with shining transparent, yellowish resin, more or less persistent. Flowers white, fragrant, in terminal, trichotomous, compound, more or less pubescent, bracteate cymes, shorter than the leaves; pedicels about ·1″ long. Calyx about ·12″ long; teeth triangular, ciliate on the margins. Corolla-lobes ·2″ long, as long as the tube, linear, acute, hairy at the mouth, puberulous within. Fruit pisiform, glabrous, black when ripe, crowned with the subpersistent calyx-teeth which ultimately leave a circular scar at the top of the fruit; seeds 4-10, wedge-shaped, rounded on the back, rugose, shining black; albumen horny; embryo very oily.

Western peninsula from the Konkan southwards and Ceylon; South Konkan and North Kanara, in monsoon-forest on the ghàts, common in the rain-forest near the Ainshi ghàt of North Kanara. Fl. at different times from December till July. Fr. R. S. A large shrub or small tree. Bark dark-coloured, smooth. Wood yellowish-white, hard, close-grained. Pores small, numerous. Medullary rays short, fine and very fine. Weighs 57 lbs. to the cub. ft.

10. RANDIA, L.

Small trees or shrubs, usually spinous. Leaves opposite, entire; stipules short, free or connate. Flowers large or small, solitary and terminal or in axillary cymes or clusters, white or yellowish. Calyx-tube various. Corolla from salver-shaped to nearly rotate; limb 5-lobed; lobes twisted in bud. Stamens 5; anthers subsessile. Disk annular or cushion-shaped. Ovary 2-celled; stigma fusiform, entire or 2-fid; ovules many, attached to a fleshy, peltate placenta. Berry globose, 2-celled, many-seeded, usually crowned by the calyx-limb. Seeds angled, immersed in pulp; testa thin; albumen horny; cotyledons orbicular.

Erect spinous shrubs or trees.
Flowers large, 1-3, terminal.
Flowers and fruits often exceeding 2″ in diameter.
Spines short, decussate, terminal ... ... 1. R. uliginosa.

Flowers and fruits usually less than 1″ in diameter.
Spines long, axillary ... ... 2. R. dumentorum

Flowers in congested leaf-opposed cymes.
Spines stout, short, sometimes absent ... 3. R. malabarica

Climbing unarmed shrubs ... ... 4. R. rugulosa

1. R. uliginosa, DC. Prodr. IV, 386; Fl. Br. I. 3. 110; Brandis For. Fl. 273; Dalz. & Gibs. Bomb. Fl. 119; Bedd. Fl. Sylv. 132; Cooke Fl. Pres, Bomb. 1, 599; Gamble Ind. Timb. 412. *Pandri, banbugri, kare,* K.; *Kantha-goting,* Vern.; *Kaurio,* Panch Mahals; *Pindara,* Kon.

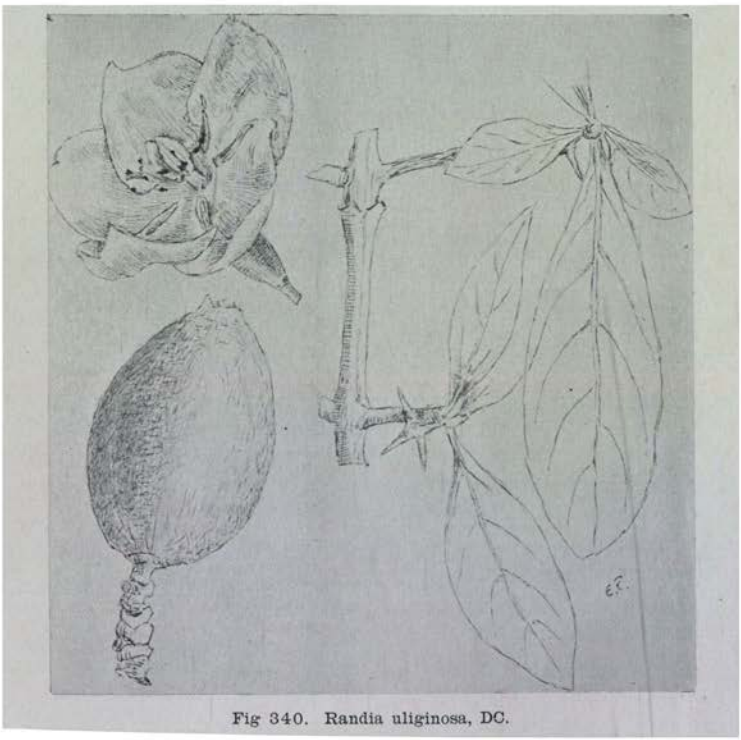

Fig 340. Randia uliginosa, DC.

A small tree; branches horizontal, quadrangular when young, usually furnished at the ends with 1-2 pairs of short, strong spines. Leaves obovate or obovate-oblong, fascicled at the ends of terminal or axillary, suppressed branchlets, 2·5″-5″ by 1·25″-2″, obtuse at the apex, gradually narrowed into the petiole at the base, thin, glabrous or sometimes pubescent beneath; lateral-nerves about 6 pairs;

petioles ·25″ long; stipules short, acute. Flowers solitary, white, scented, dimorphic; large and sessile or small and pedicelled, the large flowers are about 2″ across and have 2 separate stigmas, the smaller pedicelled flowers have a clavate stigma, marked with spiral lines. Calyx ·5″ long, green, fleshy; lobes very short, rounded and ciliate on the margins. Corolla salver-shaped, creamy-white with a very short tube furnished with a ring of hairs at the mouth; lobes 5-7, rounded and overlapping. Stamens 5-7, sessile. Fruit ovoid, smooth, yellow when ripe, about 2″ long, crowned with the persistent calyx-limb; pulp hard, edible; seeds numerous, compressed, smooth, closely packed in the pulp.

Sub-Himalayan tract from the Jumna eastwards, Oudh, Bengal, Burmah, Central, Southern and Western India; throughout the presidency in deciduous monsoon-forests, often gregarious in abandoned rice fields and open swampy places. Fl. Apl.-June. Fr. Dec.-Feb. New leaves in March-Apl.

A small deciduous tree. Bark reddish-brown, scaly. Wood whitish-grey or light-brown, close-grained, hard, smooth. Annual-rings distinctly marked. Pores small, numerous. Medullary rays fine and very fine. Weighs about 45 lbs. to the cub. ft. Fruit sometimes eaten when boiled or roasted.

2. R. dumentorum, Lamk. Ill. t. 156, f. 4; Fl. Br. I. 3, 110; Dalz. & Gibs. Bomb. Fl. 119; Brandis For. Fl. 273; Bedd. Fl. Sylv. 132; Cooke Fl. Pres. Bomb. 1, 599; Gamble Ind. Timb. 413; *R. nutans,* DC. Wight Ic. t. 581; *R. longispina*, DC. Wight Ic. t. 582; Dalz. & Gibs. Bomb. Fl. 119. *Ghela, peralu, mindhal, monigeli,* M.; *Kari-gidda, mangari, kat-mangri*, K.; *Gali,* Bhil.

A large shrub or often a small deciduous tree, armed with sharp and stout axillary spines 1″-1·5″ long; branches horizontal, usually strong and rigid. Leaves usually fascicled on the suppressed branches, obovate, ovate or spathulate, 1″-2·5″ by ·5″-1·5″, obtuse at the apex, tapering into the petiole at the base, thin, glabrous or more or less pubescent on the nerves; lateral-nerves about 8 pairs, prominent beneath; petioles hairy, ·1″-·5″ long; stipules broad-ovate, acute, ciliate on the margins. Flowers white, turning yellow when fading, fragrant, about 1″ across, solitary or 2-3 together at the ends of short, suppressed, often erect leafy branchlets; peduncles about ·25″ long. Calyx ·5″ long, densely hairy; tube broadly campanulate; lobes rounded, obtuse, spreading. Corolla hairy outside; tube as long as the calyx; lobes oblong, subacute, spreading. Fruit yellow, ovoid or subglobose, smooth or obscurely ribbed, less than 1″ in diameter, crowned with the large calyx-lobes, glabrous, 2-celled; seeds numerous, immersed in pulp, ovoid, ·15″ long, flattened: episperm smooth, yellow, hard, bony, transparent.

Very common throughout India in monsoon and dry forest areas, sometimes gregarious; Ceylon near sea-coast forest. Fl. Mch.-June. Fr. Nov.-June.

Fig 341. Randia dumentorum, Lamk.

Very variable in habit and size; an erect or straggling shrub with sometimes scandent branches or a small handsome tree. There is a distinct arborescent variety common on the laterite at Mahableshwar (4500′) with small thick, sometimes evergreen leaves, tomentose beneath and with decurved margins. Bark grey, scaly. Wood brownish, compact, hard, smooth. Annual-rings distinct. Pores very small, numerous. Medullary rays fine, short, equally distributed. Weighs 54 lbs. to the cub. ft. Used for agricultural implements, fences and fuel. The bark and fruit are employed in native medicine, the latter as an emetic. The fruit is used to poison fish, and in native medicine and when ripe is cooked and eaten.

3. R. malabarica, Lamk. Encyc. Method. 3, 25; Fl. Br. I. 3, 111; Trimen Fl. Ceyl. 2, 331; Cooke Fl. Pres. Bomb. 1, 600; Gamble Ind. Timb. 414; *Griffithia fragrans,* Wight Icon. t. 390; Dalz. & Gibs. Bomb. Fl. 119.

An erect, much branched, evergreen, spinous shrub; branches rigid, usually glabrous; spines strong, sharp, about ·5″ long. Leaves coriaceous, ovate, 1·5″-2·5″ by ·75″-1·25″, subacute at the apex, rounded at the base, quite glabrous, shining above, paler beneath; midrib prominent; lateral-nerves more or less obscure; petioles stout, channelled, about ·25″ long; stipules interpetiolar, with a ring of hairs at the inside of the broad base, glabrous without, shortly acuminate, deciduous. Flowers white, in short peduncled, leaf-opposed, glabrous cymes; bracts connate in pairs, boat-shaped, acute, glabrous, caducous. Calyx ·2″ long, campanulate, glabrous; lobes 5, triangular, acute. Corolla lemon-yellow, hairy at the mouth; tube ·2″ long, glabrous; lobes ·25″ long, ovate-oblong acute, veined. Anthers very long, exserted. Stigma fusiform. Fruit globose, at first

orange, finally black, about ·25″ in diameter, marked at the top with the scar of the calyx-limb; seeds about 8, closely packed, compressed, angled.

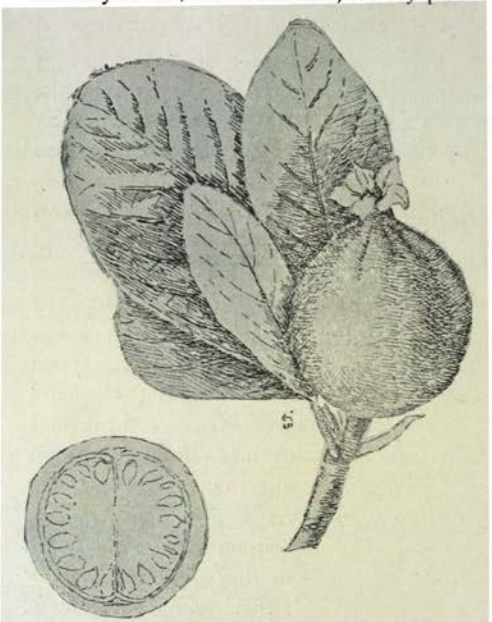

Fig 342. Randia dumentorum, Lamk.—*Fruit.*

Southern and Western India and dry regions of Ceylon; common on the Coromandel coast in scrub forests. In N. Kanara it is found near the sea at Belekerry on laterite associated with the usual thorny shrubs in isolated thickets growing on the rocky barren soil. Flowers during the H. S. Fr. R. S. Gamble states that it is a useful plant for reclothing ruined forest areas presumably on the Coromandel coast and adjoining Deccan country where it is very abundant.

An erect thorny much branched shrub. Bark brownish, rough. Wood white, hard, close-grained; weighs about 42 lbs. to the cub. ft.

4. R. rugulosa, Thw. Enum. 159; Fl. Br. I. 3, 113; Bedd. Fl. Sylv. 133; Cooke Fl. Pres. Bomb. 1, 600; Gamble Ind. Timb. 412; Var. *speciosa,* Bedd. Fl. Sylv. 133. *Tengar-balli,* K.

A large, evergreen, unarmed, glabrous shrub; branches drooping. Leaves ovate or elliptic-lanceolate, 2·5″-4·5″ by 1″-2″, thinly coriaceous, shortly acuminate at the apex, quite glabrous; lateral-nerves 6 pairs, strong, glandular-hairy in the axils beneath; petioles ·5″ long, stout, glabrous; stipules ovate, acuminate, cuspidate. Flowers about ·75″ across, in leaf-opposed paniculate, bracteate cymes, shorter than the leaves; pedicels about ·5″ long, slender, bracteolate at the base; bracts subpersistent, numerous, connate, cuspidate. Calyx glabrous, pubescent, ·25″ long; tube campanulate; lobes short, acute with broad shallow depressions between. Corolla white; tube ·3″ long; lobes oblong, acute, glabrous, as long as the calyx. Stigma large, fusiform. Fruit globose, ·3″ in diameter, crowned at the top with the scar of the calyx-limb; seeds rough, compressed, angled.

Western peninsula on the ghâts from the Konkan southwards, Ceylon. On the Konkan and North Kanara ghâts, in monsoon and rain-forest, common in the forests near Tinai and Gairsoppah; also at Bhimashankar on the Poona ghâts. Fl. Jan.-Feb. Fr. Nov.-Dec.

A lofty, unarmed climber. Stems 4″ in diameter, with a rough, lenticellate bark. Wood grey, soft, light. Pores large and moderate-sized, numerous between the broad, numerous medullary rays. Weighs about 40 lbs. to the cub. ft.

11. GARDENIA, L.

Shrubs or trees, unarmed or spinous, usually resinous. Leaves simple, opposite, rarely ternately-whorled. Flowers often large, sometimes dimorphic, showy. Calyx-limb variously cleft or lobed. Corolla-lobes 5-12, twisted in bud. Stamens as many as corolla-lobes, not exserted; anthers sessile, linear, inserted on the corolla-tube. Ovary 1-celled; style stout; stigma clavate, fusiform or 2-cleft; ovules numerous, 2-seriate on 2-6 parietal placentas. Fruit fleshy or coriaceous, indehiscent or fleshy and irregularly breaking up. Seeds numerous, immersed in the placentas; embryo small in horny albumen.

Unarmed shrubs or small trees. Flowers not dimorphic.
- Calyx-lobes 5, long-subulate, erect. Placentas 2 — 1. G. lucida.
- Calyx-lobes 5-6, minute. Placentas 4-5 ... — 2. G. gummifera.
- Calyx-lobes 5-9, lanceolate, unequal, recurved. Plancentas 4-5 ... ... — 3. G. latifolia.

Small spinous tree. Flowers dimorphic.
- Placentas 5-6 ... ... — 4. G. turgida.

1. G. lucida, Roxb. Fl. Ind. 1, 707; Fl. Br. I. 3, 115; Dalz. & Gibs. Bomb. Fl. 120; Bedd. Fl. Sylv. 134; Brandis For. Fl. 271; Cooke Fl. Pres. Bomb. 1, 602; Gamble Ind. Timb. 415. *Decamali,* Vern.

A small deciduous tree; branchlets glabrous; buds resinous. Leaves elliptic-oblong, 2·5″-6″ by 1″-3″, obtuse or subacute at the apex, narrowed into the peticle at the base, dark-green, pubescent and shining above, more or less tomentose and paler beneath; lateral-nerves numerous, 20-25 pairs, parallel and prominent beneath; petioles about ·05″ long; stipules large, ovate, acute, membranous, pubescent. Flowers near the ends of the branches, solitary, axillary, fragrant, white turning yellow; peduncles stout, about ·25″ long. Calyx ·75″ long, tomentose outside; lobes 5, each ·25″ long, linear-subulate, hairy within, tomentose outside. Corolla large; tube 1·5″-2″ long, pubescent; lobes 5, oblong, spreading as long or longer than the tube, glabrous, veined. Stamens with sessile anthers. Ovary with 2, parietal placentas; stigma entire. Fruit ellipsoid or somewhat globose, smooth, ·75″-1″ in diameter, crowned with the calyx-lobes; pericarp thick, woody.

In the dry deciduous forests of Burmah, Southern India, and the Central

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Provinces; Western peninsula, common from the Konkan southwards, Belgaum. Fl. Mch.-June. Fr. C. S.

A small tree. Bark smooth, grey, scaly. Wood yellowish-grey, close-grained, moderately hard, compact, smooth. No annual-rings. Pores very small and numerous. Medullary rays fine and very fine, distinct. Weighs about 50 lbs. to the cub. ft.; made into combs. Yields "*Dikamali*" a hard yellow or brown opaque resin with a strong disagreeable smell, used generally for skin diseases and as a veterinary ointment. The flower buds open in the evening about 6 o'clock, turn from white to yellow in a short time, and die.

2. G. gummifera, Linn. f.; DC. Prodr. IV, 381; Fl. Br. I. 3, 116; Dalz. & Gibs. Bomb. Fl. 120; Bedd. Fl. Sylv. 134-1; Brand. For. Fl. 270; Cooke Fl. Pres. Bomb. 1, 603; Gamble Ind. Timb. 415. *Dickamali*, Vern.; *Karmari*, Guz.; *Yerbhicky*, *dicky* or *bhicky-gidda*, K.

A large or small, deciduous unarmed shrub with yellow, resinous buds. Leaves ovate or elliptic-oblong, sessile, 2″-3″ by ·75″-1″, obtuse or subacute at the apex, obtuse or subcordate at the base, coriaceous, shining, pubescent when young, rough when mature; lateral-nerves 15-20 pairs, parallel and strong beneath; stipules connate, truncate or mucronate, sheathing. Flowers terminal, 1-3 together, large, white, sweet-scented, nearly sessile. Calyx ·4″ long, densely pubescent; teeth 5-6, short, triangular, acute. Corolla-tube 1″-2″ long, dilated upwards, usually glabrous, white, turning yellow in the evening of the day the flower opens; lobes 5, obovate, obtuse, glabrous, half as long as the tube. Ovary with 4-5 placentas; stigma clavate, striate. Fruit ovoid, striate, beaked, 1″-1·5″ long, crowned with the persistent calyx, 4-5-celled, many seeded; pericarp crustaceous.

Fig 343. Gardenia latifolia, Ait.

Western peninsula from the Satpuda range southwards. In open situations, common on laterite in the southern parts of N. Kanara. Fl. Mch.-May. Fr. Mch.-May.

Usually a small shrub. Wood yellowish-white, hard, close-grained. The leaf-buds are usually covered with a bright yellow resin also called *Dikamali* or *Cumbi* and used for similar purposes as that of *G. lucida*.

3. G. latifolia, Ait. Hort. Kew. 1. 294; Fl. Br. I. 3. 116; Dalz. & Gibs. Bomb. Fl. 120; Brandis For. Fl. 271; Bedd. Fl. Sylv. 134-1; Cooke Fl. Pres. Bomb. 1, 602; Gamble Ind. Timb. 415; *Pandru, ghogari, papur*, M.

A small, deciduous tree; branchlets glabrous with resinous buds. Leaves opposite or in verticels of 3, crowded at the ends of the branches, broadly ovate or obovate, 3·5″-8″ by 1·75″-5″, obtuse or very shortly acuminate at the apex, narrowed into a very short petiole at the base, thinly coriaceous, glabrous, shining above, slightly paler and pubescent beneath; lateral-nerves about 15 pairs, prominent on both sides and with hairy glands in the nerve-axils beneath; stipules connate in a sheath round the base of the stem within the petiole. Flowers large, terminal, usually solitary, nearly sessile, white changing to yellow, sweet-scented. Calyx ·75″-1″ long; limb campanulate, deeply divided into 5-9, lanceolate, subulate, hairy, unequal lobes. Corolla-tube 2″-3″ long, pubescent outside; lobes 5-9, obliquely obovate, oblong, obtuse, about half the length of the tube. Ovary with 4-5 placentas. Fruit ovoid, nearly globose, 1″-2″ in diameter, pubescent, greenish-yellow-dotted, crowned with the tube and

Fig 344. Gardenia latifolia, Ait.—*Fruit.*

long deflexed calyx-lobes; endocarp thin, hard, brittle; seeds numerous, flattened, light pale-brown in purple pulp.

Dry forests of Western, Central and Southern India, Garhwal ascending to 3000′, Behar and Western Bengal; common in the dry forests of the presidency. Fl. Apl.-May. Fr. next cold season.

A small tree. Bark grey, smooth, scaling off, leaving rounded depressions somewhat similar to those found on *Anogeissus latifolia;* inner-bark thick, white, soft. Wood yellow-white, close-grained, mottled, moderately hard and smooth. Annual-rings distinct. Pores very small, numerous. Medullary rays fine, short and close. Weighs about 60 lbs. to the cub. ft. Recommended as a substitute for boxwood. Used for making combs. The leaf-buds yield resin like the other species but in smaller quantities.

4. G. turgida, Roxb. Fl. Ind. 1, 711; Fl. Br. I. 3, 118; Brandis For. Fl. 270; Cooke Fl. Pres. Bomb. 1, 601; Gamble Ind. Timb. 416; *G. montana,* Roxb.; Dalz. & Gibs. Bomb. Fl. 120. *Kurphendra,* M.; *Pendra,* Vern. *Bengeri, boothbangari, boodbagari, bonnagavi,* K.

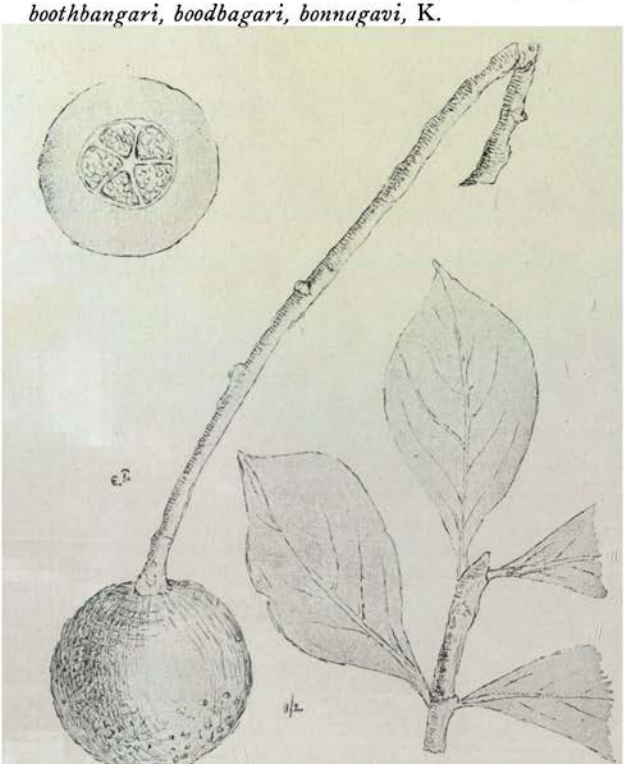

Fig 345. Gardenia turgida, Roxb.

A small, deciduous, spinous tree; spines long, bearing flowers and leaves. Leaves 2″-3·5″ by 1·5″-2·25″, obovate, obtuse or shortly acuminate at the apex, long cuneate at the base, sessile, glabrous above, tomentose beneath; lateral-nerves 4-6 pairs not prominent; stipules triangular, cuspidate, caducous. Flowers dimorphic, usually on leafless, axillary spines; the males fascicled and the females solitary. Male fl.: Calyx ·2″ long, turbinate, pubescent; mouth wide, truncate; teeth minute. Corolla

·75″-1″ long, glabrous; lobes 5, longer than the tube. Female fl: Calyx ·3″-·75″ long; tube dilated at the mouth; teeth foliaceous, ·12″ long. Corolla of male. Ovary with 5-6 placentas. Fruit subglobose, grey, rough or smooth, 2″-3″ in diameter; pericarp thick, woody; endocarp hard, bony, 5-valved.

Sub-Himalayan tract from Nepal to the Jumna, ascending to 4000′, Southern, Western and Central India and Burmah. In deciduous forests throughout the presidency, common in Dharwar and North Kanara. Fl. H. S. Fr. R. & C. S. Foliage of young plants distinct from that of mature trees.

A small conspicuous tree. Bark smooth, grey-mealy. Wood white with a purplish tinge, smooth, close-grained, moderately hard and durable. Annual-rings visible but not distinct. Pores very small and numerous. Medullary rays fine and very fine, distinct, numerous. Weighs about 46 lbs. to the cub. ft. Wood suitable for carving and turning.

12. DIPLOSPORA, DC.

Evergreen shrubs or trees. Leaves opposite, simple, shortly petioled; stipules triangular, acuminate or with setaceous points. Flowers small, white, in axillary fascicles or cymes, polygamo-dioecious; bracts free or connate in a cup. Calyx-tube short; limb truncate. Corolla-tube short; lobes 4-5, spreading, twisted in bud. Stamens 4-5; filaments short or long, anthers often recurved. Ovary 2-3-celled; style 2-branched; ovules 2-3 in each cell. Berry ovoid or globose. Seeds few, imbricate.

Fruit sessile, ellipsoid	...	...	...	1. D. apiocarpa.
Fruit pedicelled, globose	...	...	...	2. D. sphærocarpa.

1. D. apiocarpa, Dalz. in Hook. Kew Jour. 2, 257; Fl. Br. I. 3, 123. *Discospermum apiocarpum,* Dalz. & Gibs. Bomb. Fl. 120; Bedd. Fl. Sylv. t. 223.

A moderate-sized or large resinous tree. Leaves ovate or elliptic-lanceolate, 3·5″-6″ by 1·5″-3″, obtusely acuminate at the apex, narrowed into the petiole at the base, coriaceous; lateral-nerves 6-8 pairs, often with hairy glands in the axils beneath; petioles ·5″-·75″ long; stipules ·4″ long, triangular, acuminate. Flowers 4-merous, white, scented, male and bisexual on different trees, in axillary fascicles, nearly sessile; buds resinous; bracts connate into a cup at the base of the flower. Calyx campanulate, ·1″ long, covered with resin; limb usually truncate, sometimes with several minute, irregular teeth. Corolla glabrous, ·25″ long; lobes oblong, obtuse. Stamens much exserted. Fruit sessile, ·75″ long, ellipsoid or pyriform, crowned with a conical beak within the calyx-limb; seeds few, flat, irregularly compressed.

Western peninsula on the ghâts from the Konkan southwards; rain-forests on the higher ghàts of the Konkan and probably North Kanara. Fl. R. S.

2. D. sphærocarpa, Dalz. in Hook. Kew Jour. 2, 257; Fl. Br. I. 3, 123. *Discospermum sphærocarpum,* Dalz. & Gibs. Bomb. Fl. 120; Bedd. Fl. Sylv. 134.

Fig 346. Diplospora sphærocarpa, Dalz.

A small, glabrous, evergreen tree. Leaves ovate or elliptic-lanceolate, 2·5″-3·5″ by 1″-1·5″, shortly acuminate at the apex, narrowed into the petiole at the base, coriaceous, glabrous, shining above, pale beneath; lateral-nerves 4-5 pairs, prominent, with small, hairy, saccate glands in the axils beneath; petioles ·25″-·5″ long; stipules closely adpressed, shortly acuminate, about ·25″ long. Flowers sessile, fascicled on a short peduncle without connate bracts. Calyx-limb

4-lobed, resinous outside; lobes ·05″ long, obtuse, ciliolate, equalling the oblong tube. Corolla-tube shorter than the calyx-lobes; throat glabrous; lobes ·12″ long, oblong, obtuse. Fruit globose, ·5″ in diameter, not beaked, crowned with the scar of the calyx-limb and longitudinally striate; pedicels about ·1″ long; seeds few, vertically imbricate.

Endemic in the Western peninsula on the ghâts from Bombay southwards, rare; ascending to 6000′ in the Nilghiris. Fl. Oct. Fr. May.

13. CANTHIUM, Lam.

Unarmed or spinous trees or shrubs, sometimes scandent. Leaves opposite, simple; stipules connate, interpetiolar, pointed, with a broad base. Flowers small, axillary, fascicled or cymose. Calyx-tube short; limb 4-5-toothed. Corolla-tube with a ring of deflexed hairs within; throat villous; lobes valvate in bud. Ovary 2-celled; stigma large; ovules 1 in each cell. Drupe didymous with 1-2 pyrenes. Seeds with fleshy albumen; embryo long; cotyledons short.

Unarmed tree. Flowers umbellate on a short peduncle ... ... 1. C. didymum.

Spinous shrubs, scandent or rigid-rambling. Flowers fascicled.

Scandent. Spines short, recurved. Leaves shining above ... ... 2. C. Rheedii.

Rigid-rambling. Spines long, straight. Leaves not shining ... ... 3. C. parviflorum.

1. C. didymum, Roxb.; Bedd. Fl. Sylv. t. 221; Brandis Ind. Trees, 385; Gamble Ind. Timb. 419; *C. umbellatum,* Wgt. Ic. t. 1034; Fl. Br. I. 3, 132; Dalz. & Gibs. Bomb. Fl. 113; *Plectronia didyma,* Brandis For. Fl. 276; *P. Wightii,* Cooke Fl. Pres. Bomb. 1, 606. *Tupa, arsul,* M.; *Yellal, hunnagere, hanigigari,* K.

A small evergreen tree; branchlets green, often more or less quadrangular. Leaves elliptic, very thick, coriaceous, 3·5″-5″ by 1·5″-3″, obtuse or shortly acuminate at the apex, narrowed at the base into a very short petiole, glabrous shining above, paler beneath; lateral-nerves 4 pairs, prominent above and often with hollow glands in the axils beneath; petioles stout, about ·2″ long; stipules coriaceous with a long subulate acumination at the apex. Flowers 5-merous, sweet-scented, in many-flowered, axillary, peduncled umbels or umbelliform cymes in opposite axils; peduncles ·25″ long, stout; pedicels ·75″ long, slender. Calyx-tube globose, glabrous, ·12″ long; teeth very small. Corolla white; tube ·25″ long, densely white-

hairy in the throat; lobes oblong, acute, ¾ the length of the tube. Fruit obovoid, didymous, about ·5″ long, black-purple, shining when ripe; pyrenes warted.

Sikkim Himalaya, Bengal, Central and Southern India, Western peninsula from the Konkan southwards, Ceylon in the moist low country; common in the rain-forests of the Konkan and North Kanara. Fl. Nov.-Jany. Wood grey or reddish-grey, hard, close-grained. Annual-rings distinct. Pores very small, numerous. Medullary rays fine and very fine, numerous, marked by a narrow or broad line of dark-coloured tissue, accompanied by supplementary lighter and darker rings. Weighs 42 lbs. to the cub. ft. Young branches sometimes sharply 4-angled. Ressembles box-wood so closely that it is sometimes called *Ceylon box-wood*; used for making combs by the Siddapore goodegars in North Kanara.

2. C. Rheedii, DC. Prodr. IV, 474; Fl. Br. I. 3, 134; Dalz. & Gibs. Bomb. Fl. 113; *Plectronia Rheedii,* DC.; Bedd. Fl. Sylv. 134-5; Cooke Fl. Pres. Bomb. 1, 606; *C. angustifolium,* Roxb. Fl. Br. I. 3, 135; *C. Leschenaultii,* W. & A.; Dalz. & Gibs. Bomb. Fl. 113. *Chapyel,* M.; *Ambgari, ambgani,* K.

A rigid, long-branched, evergreen, spinous, scandent shrub; branches divaricate, slender; stem armed to near the base; spines supra-axillary about ·5″ long, curved or straight. Leaves broadly ovate, 1″-4″ by ·75″-2″ acuminate, acute or subobtuse at the apex, cordate or rounded at the base, thin, dark-green, shining, glabrous above, paler, sometimes with a few bristly hairs beneath; lateral-nerves about 5 pairs, distinct beneath, with small, hairy, saccate glands in the axils; petioles short, ·1-·25″ long; stipules broad, cuspidate, rufous-hairy. Flowers small, green, axillary, solitary or few-fascicled, sometimes in small, sessile cymes; pedicels ·1″ long; buds ovoid, acute. Calyx ·12″ long, turbinate; limb spreading with 5, minute, distant teeth. Corolla ·3″ long; tube short, wide, bristly-hairy within; lobes 5, ovate, acute. Anthers small, exserted. Style hairy; stigma 2-lobed, mitriform. Fruit didymous, less than ·5″ broad, not so long, compressed and bilobed at the top; pyrenes warted like those of *C. didymum.*

Western peninsula from the Konkan southwards; common in the rain-forests of the Konkan and North Kanara. Bark smooth, shining. Stem 1″ in diameter Fl. & Fr. at different times throughout the year. Fruit edible.

3. C. parviflorum, Lamk. Dict. 1, 602; Fl. Br. I. 3, 136; Dalz. & Gibs. Bomb. Fl. 113; Gamble Ind. Timb. 412; *Plectronia parviflora,* Roxb.; Bedd. Fl. Sylv. 134-5; Cooke Fl. Pres. Bomb. 1, 607; *Kirna,* M.; *Kari,* K.

A stout deciduous, erect or rambling shrub with rigid, spreading, spinous branches; spines supra-axillary, straight, often nearly horizontal, about 1″ long, sometimes wanting. Leaves often fascicled, elliptic, 1″-2·5″ by ·5″-1·3″, bluntly acuminate or obtuse at the apex, rounded or narrowed into the petiole at the base, green, glabrous above, paler beneath; lateral-nerves about 6 pairs, conspi-

cuous beneath; petioles ·25″ long, slender; stipules short, triangular with a long subulate point. Flowers 4-merous, small, greenish-yellow, in many-flowered, often peduncled cymes which are sometimes fascicled; pedicels of variable length, slender. Calyx-lobes triangular, acute. Corolla-tube inflated, globose, about ·15″ long; lobes ovate, acute, about as long as the tube. Style glabrous; stigma globose. Fruit ovoid, rough, about ·6″ long, areolate at the top; yellow when ripe, edible.

Fig 347. Canthium parviflorum, Lamk.

Western peninsula from the Konkan southwards. Very common in dry, open situations throughout the presidency also along and near the coast on laterite. A rigid shrub, sometimes semi-scandent in hedges. Fl. & Fr. at different times throughout the year. Wood grey, hard. Pores small numerous. Medullary rays fine, regular. Used for turning and the branches for fencing. The leaves are eaten in curries.

14. VANGUERIA, Juss.

A spinous tree. Leaves and flowers as in *Canthium*, but ovary, usually 5-celled. Drupe large, globose, 1″ in diameter, smooth; pyrenes 4-5, woody, smooth.

V. spinosa, Roxb. Fl. Ind. 1, 537; Fl. Br. I. 3, 136; Cooke Fl. Pres. Bomb. 1, 607; Gamble Ind. Timb. 420. *Mulla-kare, gobergally, gund-kare,* K.; *Alu, huloo, halawni,* M.

A small, spinous, deciduous tree; spines straight, sharp, about 1″ long, sometimes ternate. Leaves ovate or ovate-lanceolate, 2″-5″ by 1·25″-2·75″, acuminate at the apex, narrowed into the petiole and cuneate at the base, membranous, glabrous above, pubescent on the nerves and paler beneath; lateral-nerves 6-8 pairs, glandular-hairy in the axils beneath; petioles ·25″-1″ long, slender, grooved; stipules broad-triangular with a subulate acumination at the apex, early caducous. Flowers pentamerous, greenish-white, in shortly peduncled cymes from the old scars beneath the leaves; pedicels ·5″ long, slender. Calyx 5-toothed; tube cup-shaped, ribbed, somewhat rugose; teeth triangular, acute. Corolla ·3″ long; throat hairy, glabrous outside; lobes 5 as long as the tube,

acute or acuminate. Fruit depressed-globose, about 1″ in diameter, on slender peduncles, smooth, yellowish-green when ripe, edible; pyrenes 4-5, hard, smooth, 1-seeded.

Northern Bengal to Kanara, Burmah, Pegu and Tenasserim; common in the monsoon-forests of the Konkan and Deccan ghâts also in North Kanara and Belgaum.

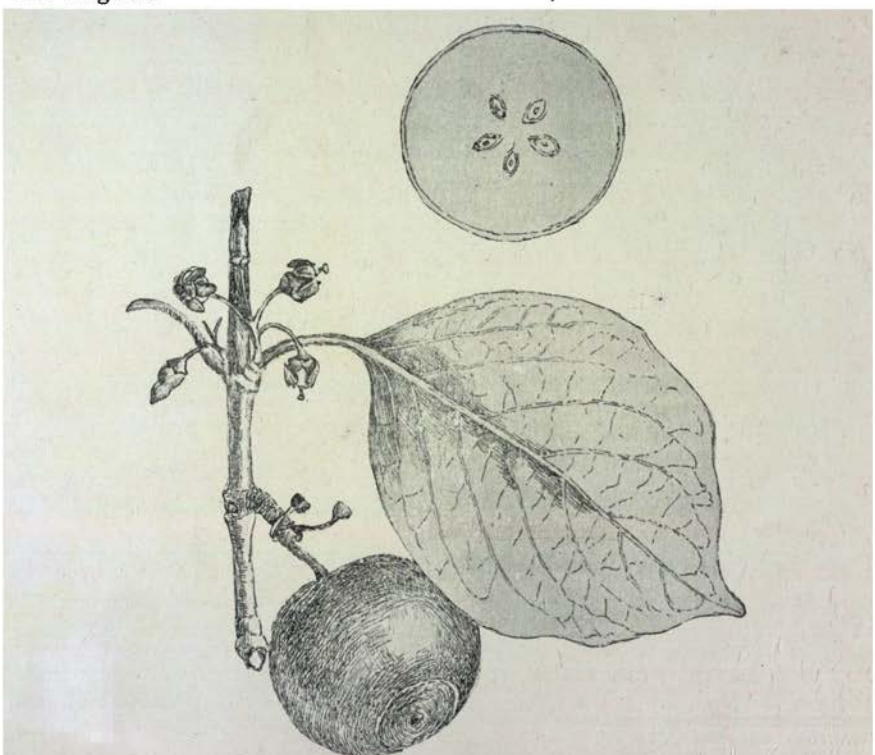

Fig 348. Vangueria spinosa, Roxb.

A small or moderate-sized tree. Bark dark-coloured, nearly smooth or with shallow fissures; inner-bark with 5 or 6 alternate layers of white and red tissue.

Wood pinkish-brown or white, close-grained, moderately hard and heavy. Annual-rings distinct. Pores small, numerous. Medullary rays numerous, fine and very fine. Weighs 55 lbs. to the cub. ft. Fruit globose, smooth, 1″-2″ in diameter, on slender peduncles, turns yellow when ripe, edible but not palatable.

15. IXORA, L.

Shrubs or small, mostly evergreen trees. Leaves opposite, rarely ternately whorled with interpetiolar stipules. Flowers usually tetramerous, often showy, in axillary and terminal, corymbose cymes. Calyx 4-5-toothed or lobed. Corolla-tube long, slender; lobes 4, rarely 5, spreading. Stamens 4 (rarely 5); filaments short or 0, inserted at the mouth of the corolla. Ovary 2-celled; style filiform, exserted; stigma slender, fusiform, or 2-lobed; 1 ovule in each cell peltately attached to the septum. Fruit a small berry or drupe with 2 plano-convex, ventrally concave, coriaceous pyrenes. Seeds peltate; testa membranous; albumen sometimes horny.

Erect shrubs. Leaves green when dry. Flowers white or pink.
- Calyx-teeth longer than the ovary.
  - Fruit glabrous, smooth ... ... 1. I. lanceolaria.
  - Fruit hairy, striate ... ... 2. I. polyantha.
- Calyx-teeth shorter than the ovary ... ... 3. I. elongata.

Small trees.
- Flower-buds very small; limb of corolla globose 4. I. brachiata.
- Flower-buds larger; limb of corolla ellipsoid ... 5. I. parviflora.

Shrub. Leaves green when dry. Flowers scarlet 6. I. coccinea.

Shrub. Leaves black when dry. Flowers white 7. I. nigricans.

1. I. lanceolaria, Colebr. in Roxb. Fl. Ind. 1, 387; Fl. Br. I. 3, 138; Cooke Fl. Pres. Bomb. 1, 608; Wight's Ic. t. 827; Brandis Ind. Trees, 388.

A small, erect shrub; branchlets slender, terete, swollen at the nodes. Leaves oblong-lanceolate, 4″-8″ by 1·5″-2″, acute at the apex, narrowed into the petiole at the base, thin, glabrous; lateral-nerves slender, about 15 pairs; petioles ·1″-·15″ long; stipules with a short, broad base, ending in a long subulate point. Flowers slender-pedicelled, in large, terminal, brachiate cymes 3″-6″ in diameter, supported at the base by 2 floral leaves; bracts at the bases of the cyme-branches subulate, caducous; bracteoles 2 at the base of the calyx, and adpressed to it about ·12 long, subulate. Calyx pubescent; tube very short; lobes thick, linear-lanceolate, acute, about ·1″ long. Corolla 1·25″ long, white; tube long, slender, twice the length of the lobes; lobes linear-oblong, obtuse, spreading or deflexed. Filaments ·2″ long, half the length of the slender anthers which are tailed at the base and acute at the apex. Style slender, long-exserted; branches of the stigma linear, half as long as the exserted part of the style. Fruit didymous, ·25″ in diameter, smooth, crowned with the 4, erect, acute, calyx-lobes, red when ripe; seeds 2, globose, in white pulp, hollow in the centre; episperm crustaceous.

Western peninsula from Belgaum southwards; common in the rain-forests of North Kanara, particularly on the southern ghâts. Fl. R. and C. S. Fr. Aug.

2. I. polyantha, Wgt. Ic. t. 1066; Fl. Br. I. 3, 140; Bedd. Fl. Sylv. 134-7; Cooke Fl. Pres. Bomb. 1, 609.

A small shrub; branches thick, glabrous. Leaves ovate-lanceolate, 6″-12″ by 2·5″-5″, thinly coriaceous, glabrous, dark-green above, pale beneath, acute or acuminate at the apex, acute at the base; lateral-nerves about 12 pairs, strong beneath; petioles very short or O; stipules broad at the base, cuspidate. Flowers white-woolly, in large, corymbiform, terminal, usually closed cymose heads 3″-4″ in diameter; branches pubescent; bracts small, sessile, acute at the apex, caducous; bracteoles linear. Calyx-tube hairy, about ·2″ long; lobes broad, acute, erect, glabrous. Corolla-tube slender, 1″ long, glabrous, slightly dilated upwards; lobes linear, obtuse, about ½ the length of the tube, reflexed. Style long, slender; stigma with 2 recurved branches, exserted. Fruit ovoid, red, somewhat compressed, ·5″ long, striate, sparsely hairy, 1-2-seeded, crowned with the erect calyx-lobes at the apex; seeds ovoid, ·25″ long, in mealy pulp; episperm crustaceous, smooth; central placenta hollow, small; albumen fleshy; embryo dorsal.

Western peninsula from the Konkan to Cochin; common on the southern ghâts of North Kanara in rain-forests. Fl. Feb.-Mch. Fr. ripe Nov.-Feb.

A small ornamental flowering-shrub worth introducing into gardens.

3. I. elongata, Heyne in Wall. Cat. 6131; Fl. Br. I. 3, 141; Cooke Fl. Pres. Bomb. 1, 610; *I. pedunculata*, Dalz. & Gibs. Bomb. Fl. 113.

A small, erect shrub; branchlets terete, glabrous. Leaves elliptic-lanceolate, 2·5″-6·5″ by 1·5″-2·5″, subacute at the apex, narrowed into the petiole at the base, thinly coriaceous; lateral-nerves 10-15 pairs, slender; petioles stout, ·2″-·25″ long; stipules broad at the base ending in a long setaceous point, glabrous. Flowers pink, in long-peduncled, terminal, pubescent, corymbose cymes; main-peduncles 4″-6″ long; lower cyme-branches red, pubescent, 2″-4″ long; bracts large, foliaceous, sessile, cordate; bracteoles linear, glabrous or pubescent. Calyx hairy, ·1″ long; teeth 4, subulate, subobtuse, about equalling the ovary. Corolla-tube slender, pink, ·25″-·5″ long; lobes 4, linear, green, half as long as the tube. Filaments thick, short; anthers sagittate at the base, apiculate at the apex. Fruit glabrous, 2-lobed, black when ripe.

Western peninsula from Bombay to Kurg; Konkan and N. Kanara along the ghâts in monsoon-forest. Fl. Feb. Fr. H. S.

4. I. brachiata, Roxb. Fl. Ind. 1, 381; Fl. Br. I. 3, 142; Cooke Fl. Pres. Bomb. 1, 610. *Gorbale,* K.

A small, evergreen, nearly glabrous tree. Leaves elliptic-oblong or oblong, 3″-4·5″ by 1·5″-2″, obtuse at the apex, usually more or less attenuated at the base, coriaceous, glabrous shining, pale when dry; lateral-nerves numerous, slender, faint; petioles stout, ·25″-·5′ long; stipules short, broad, cuspidate, subpersistent. Flowers white, sweet-scented, in sessile or shortly peduncled, brachiate, puberulous cymes with 3-4 pairs of long or short, opposite branches; lower bracteoles stipuliform; upper bracts and bracteoles subulate. Calyx minute, urceolate, shortly triangular-toothed, more or less pubescent and ciliolate. Corolla-tube slender, glabrous, ·15″-·2″ long; lobes broad ovate, obtuse, globose in bud, about ¼ the length of the tube, deflexed. Anthers sessile. Style glabrous, slightly exserted; stigmatic branches at first connate, afterwards free. Fruit didymous, black or reddish, succulent, edible, about the size of a pea; seeds with a large ventral hollow surrounding the peltately attached funicle.

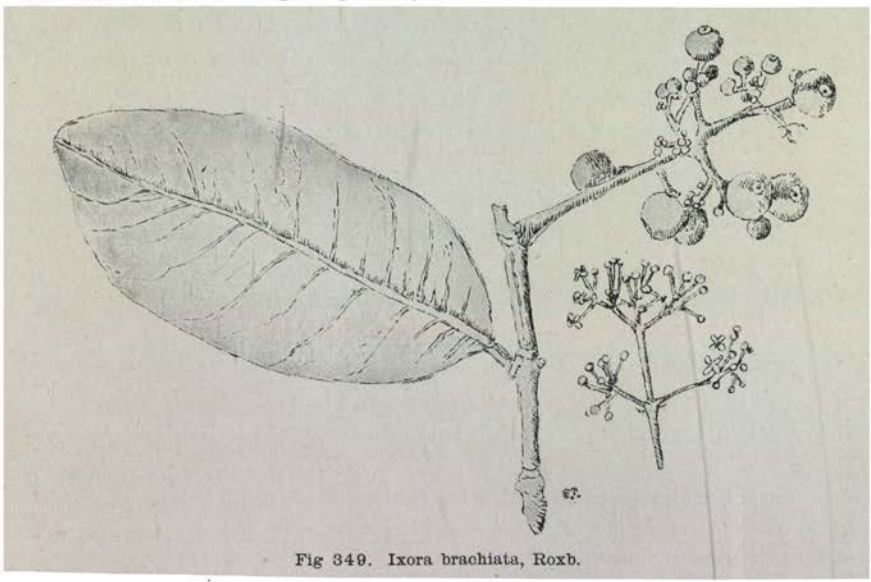

Fig 349. Ixora brachiata, Roxb.

Western peninsula from the Konkan southwards in monsoon and rain-forest; common on the Konkan and North Kanara ghâts. Fl. C. S. Fr. Apl.-May.

A small evergreen tree. Bark smooth, grey with a thin, hard, corky layer; inner-bark ·25″ thick, dark-purple, with a few white veins. Wood reddish-grey, hard, smooth, compact. Annual-rings indistinct. Pores small, numerous, equally distributed. Medullary rays fine and very fine, the latter indistinct. Weighs 52 lbs. to the cub. ft. Flowers very small; buds globose. The black succulent pulp of the fruit has a sweet taste.

5. I. parviflora, Vahl. Symb. iii. 11. t. 52; Fl. Br I. 3, 142; Bedd. Fl. Sylv. t. 222; Dalz. & Gibs. Bomb. Fl. 113; Brandis For. Fl. 275; Cooke Fl. Pres. Bomb. 1, 611; Gamble Ind. Timb. 421. *The Torch Tree. Kurat, kura,* M. *Hennu, gorvi,* K; *Makrichijhar,* Hind.

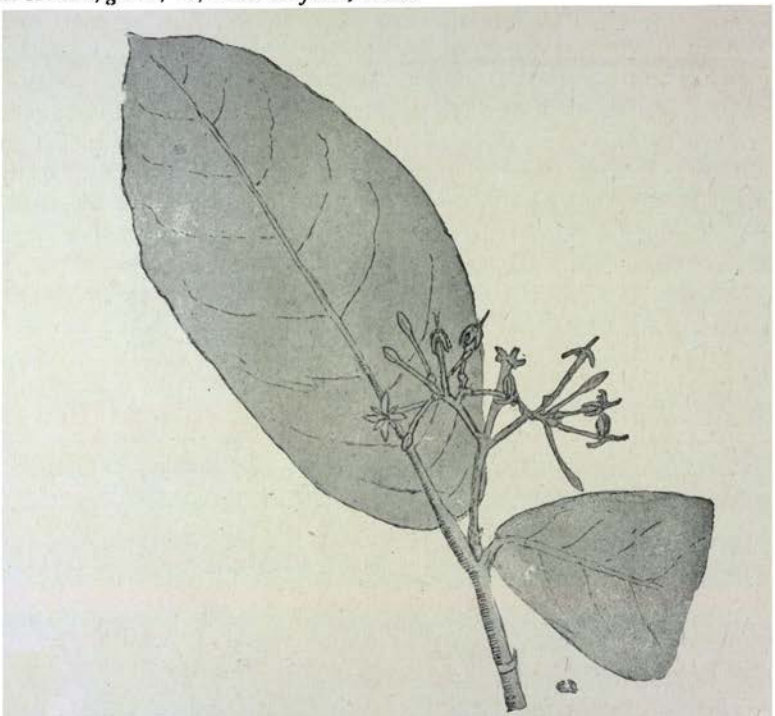

Fig 350. Ixora parviflora, Vahl.

A small, evergreen tree; branchlets slightly compressed, glabrous. Leaves ovate-oblong, 3″-4″ by 1·5″-2″, coriaceous, glabrous, shining, pale when dry, obtuse or very shortly acuminate at the apex, rounded at the base, sometimes cordate; lateral-nerves slender, numerous; venation reticulate; stipules broad, coriaceous, shortly cuspidate; petioles very short and stout. Flowers white, sweet-scented, in subglobose clusters, arranged in sessile, brachiate, pubescent or glabrous cymes with 3-5 pairs of opposite, short branches; bracts and bracteoles as in *I. brachiata.* Calyx minute, cup-shaped; teeth 4, very small, subacute. Corolla-tube stout, glabrous, ·3″-·4″ long; lobes 4, linear-oblong, obtuse, ellipsoid in bud, reflexed. Anthers sessile, nearly as long as the corolla-lobes. Style densely pubescent; stigma 2-branched, exserted. Fruit small, ·25″ in diameter, globose or didymous.

Western Bengal, Behar, Burmah, Central, Southern and Western India from the Satpuras, (Akrani, Toranmal, 3700′), southwards to Ceylon; throughout the presidency in deciduous forests. Fl. Mch.-Apl. Fr. May-June. A small, handsome, evergreen tree. Bark dark-coloured, covered with raised dots; inner-bark brown. Wood light-brown, smooth, very hard and close-grained. Annual-rings visible but not distinct. Medullary rays fine. Suitable for turning. Used for furniture and building purposes in Madras. The green branches make excellent torches.

6. I. coccinea, Linn. Sp. Pl. 110; Fl. Br. I. 3, 145; Dalz. & Gibs. Bomb. Fl. 112; Brandis For. Fl. 275; Bedd. Fl. Sylv. 134-7; Cooke Fl. Pres. Bomb. 1, 611; Gamble Ind. Trees. 420; *I. Bandhuka,* Roxb. Fl. Ind. 1, 376. *Flame of the Woods. Bakora, pendgul,* M.; *Gudde-dasal,* K.; *Patkali,* Kon.

Fig 351. Ixora coccinea, Linn.

A small, much branched, glabrous, handsome-flowering shrub. Leaves sessile, ovate or oblong, 2″-4″ by 1″-2″, obtuse or acute, apiculate at the apex, rounded or subcordate at the base, coriaceous, dark-green, pale when dry; lateral-nerves about 10 pairs; stipules broad at the base, cuspidate. Flowers bright-scarlet in dense, sessile or shortly peduncled, cymose corymbs; buds fusiform, very acute; bracts and bracteoles small, subulate, acute. Calyx ·1″ long, glabrous; teeth triangular, acute. Corolla-tube slender, 1″-1·5″ long; lobes ovate, acute, nearly ·5″ long. Style with a bilobed, exserted stigma. Fruit globose, pisiform, red, 2-seeded, crowned with the calyx-teeth; seeds plano-convex, more or less ventrally concave, rough and scaly.

Western peninsula from Bombay southwards, often cultivated; very common in the Konkan and North Kanara monsoon-forests near the coast also on the ghâts along river banks. Fl. and Fr. throughout the year.

An ornamental shrub. Wood grey, smooth, rather soft Pores small, unequally distributed in radial lines. Medullary rays fine, very numerous and

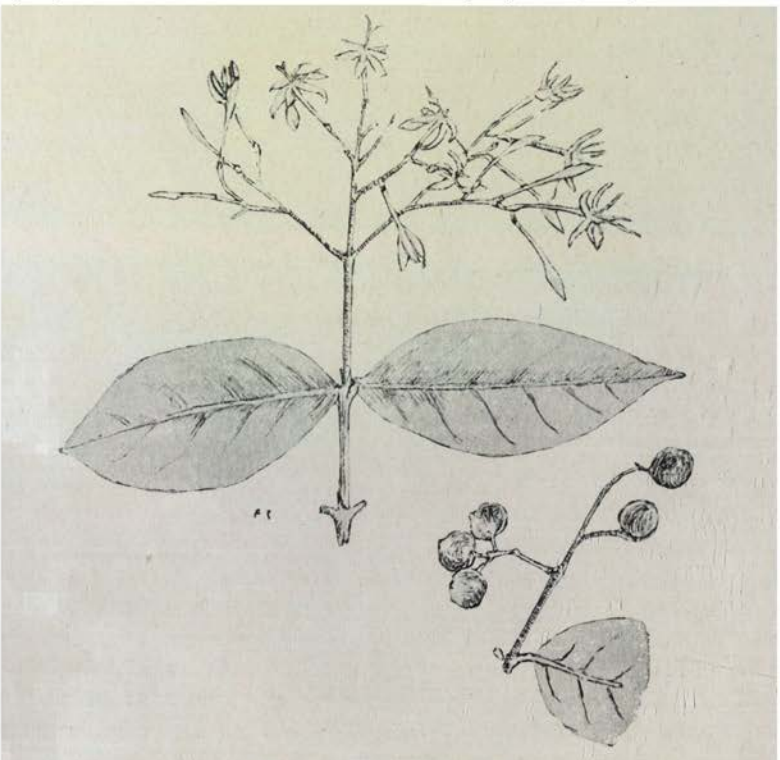

Fig 352. Ixora nigricans, Br.

close together, crossed by close, fine, wavy lines of light-coloured tissue. Weighs 40 lbs. to the cub. ft. Flowers sacred to Siva and Vishnu; used in native medicine for ophthalmia.

7. I. nigricans, Br. in Wall. Cat. 6154; Fl. Br. I. 3, 148; Cooke Fl. Pres. Bomb. 1, 611; Dalz. and Gibs. Bomb. Fl. 113. *Lokhandi, katkura,* M.

A large or small, erect, evergreen shrub; leaves etc. turn black when dry. Leaves elliptic-lanceolate or oblanceolate, 4″-7″ by 1·5″-3″, acute or shortly acuminate at the apex, acute or rounded at the base, thin chartaceous, glabrous; lateral-nerves about 13 pairs, slender; petioles ·25″-·4″ long; stipules shortly triangular, cuspidate with a long, stiff bristle. Flowers white, in short peduncled, brachiate cymes, broader than long; lower pair of bracts small, foliaceous; upper bracts and bracteoles subulate; buds narrow, slender, fusiform. Calyx glabrous, ·1″ long; teeth short, triangular, acute. Corolla-tube slender, glabrous within and without, ·5″ long; lobes linear, half as long as the tube, deflexed. Style glabrous, with 2, long, recurved branches, exserted. Fruit black or red, fleshy, globose or didymous, size of a large pea; seeds plano-convex or globose with a large central cavity.

Western peninsula from the Konkan southwards; Eastern peninsula from Pegu to Malacca; very common in the rain-forests of North Kanara, also in the Konkan. Fl. apparently throughout the year.

16. PAVETTA, L.

Shrubs or small trees. Leaves opposite, usually membranous; stipules intrapetiolar, deciduous, usually connate into a sheath. Flowers in trichotomous, corymbose cymes. Calyx-tube ovoid or turbinate; lobes 4, short or long. Corolla-tube slender; lobes 4-5. Stamens 4, inserted in the throat of the corolla. Ovary 2-celled; style long-exserted; stigma undivided, fusiform or 2-dentate; 1 ovule in each cell, attached to a prominent, fleshy often tumid placenta. Fruit a fleshy berry with 2 pyrenes; seeds conform with the pyrenes; albumen horny; embryo incurved at the back of the seed.

Leaves green when dry. Corolla white; tube ·5″ long	1.	P. indica.
Leaves turning black when dry. Corolla yellowish; tube more than 1″ long	2.	P. hispidula.

1. P. indica, Linn.; DC. Prodr. IV, 490; Fl. Br. I. 3, 250; Dalz. & Gibs. Bomb. Fl. 112; Brandis For. Fl. 275; Bedd. Fl. Sylv. 134-5; Cooke Fl. Pres. Bomb. 1, 612; Gamble Ind. Timb. 421; *P. Brunonis,* Wgt. Ic. t. 1065; Dalz. & Gibs. Bomb. Fl. 112; *Pavati, pappadi,* K.; *Papadi,* M.

A large, glabrous or tomentose shrub; branchlets spreading, terete or more or less obtusely quadrangular. Leaves elliptic-lanceolate, elliptic or obovate, 3″-6″ by 1·5″-2·5″, obtuse, acute or acuminate at the apex, narrowed into the petiole at the base, thin membranous, glabrous or more or less pubescent or tomentose,

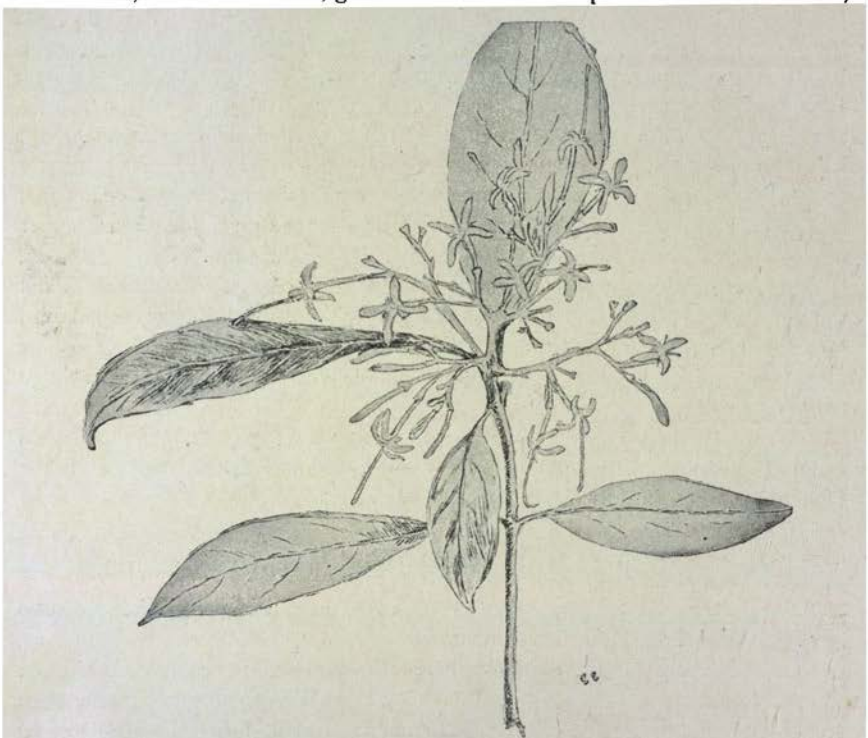

Fig 353. Pavetta indica, Linn.

shining above, paler beneath; lateral-nerves 8-10 pairs, prominent beneath; venation with small, hard, raised points or warts, more abundant and prominent on the upper than on the lower surface of the leaf; petioles ·25″-·5″ long; stipules connate, acute, thin, deciduous. Flowers white, scented, glabrous, in many-flowered, terminal, lax, corymbose pubescent cymes; bracts membranous, the lower cupular; buds linear, clavate; pedicels ·2″ long, pubescent. Calyx densely pubescent, ·12″ long; tube narrowly campanulate; lobes triangular, acute and slightly reflexed at the apex. Corolla-tube ·5″ long; lobes linear-oblong, about ½ the length of the tube. Style slender, exserted, glabrous; stigma narrowly clavate, puberulous. Fruit black, globose, succulent, ·25″-·6″ in diameter, smooth, shining.

Tropical India from the Western Himalaya to Burmah and southwards to Ceylon, Malacca and Penang; common throughout the presidency. Fl. Mch. May. Fr. R. S. A stout, bushy shrub. Wood light-brown, hard, close-grained. Pores extremely small. Medullary rays short, numerous, fine and very fine.

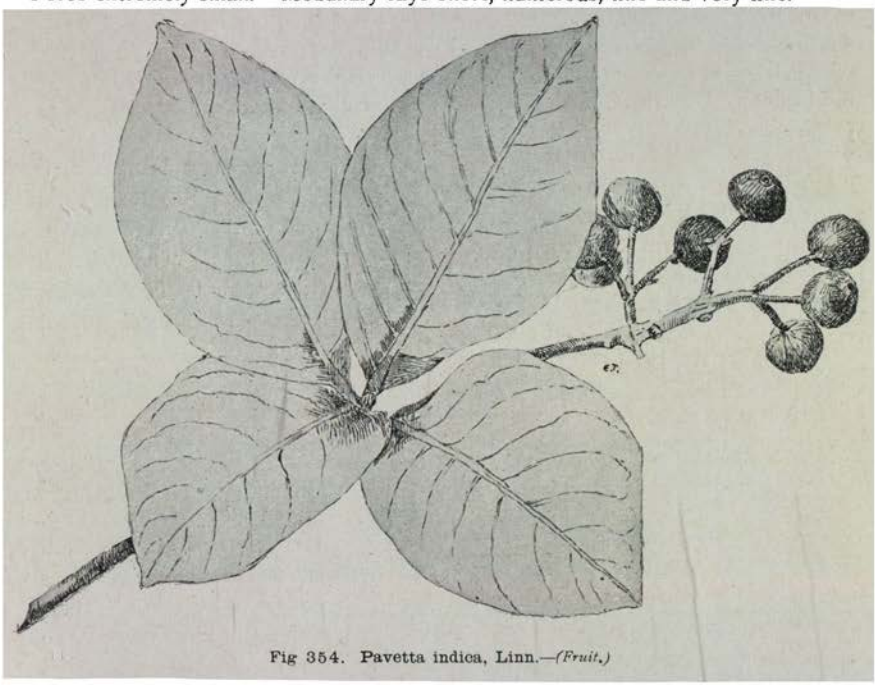

Fig 354. Pavetta indica, Linn.—*(Fruit.)*

There are two well marked varieties of this species sometimes considered as separate species viz. *indica proper*, with glabrous leaves, branches and inflorescence; common in monsoon and rain-forest along the ghâts, at Mahableshwar (4500′) on laterite; var. *tomentosa,* with leaves and cymes softly tomentose beneath. On laterite near the sea coast also in the dry deciduous forests of the Dharwar district and elsewhere throughout the presidency, not so common as var. *indica proper.*

2. P. hispidula, W. & A. Prodr. 431; Var. *siphonantha,* Fl. Br. I. 3, 151; Cooke Fl. Pres. Bomb. 1, 613; *P. siphonantha,* Dalz. & Gibs. Bomb. Fl. 112; Bedd. Fl. Sylv. 134-8.

A large, much-branched shrub; branchlets compressed, obtusely quadrangular, pubescent. Leaves elliptic-lanceolate or obovate, 2″-8″ by ·5″-3″, shortly acuminate at the apex, attenuate at the base, membranous, glabrous above, more

or less pubescent beneath, drying black; petioles short, about ·25″ long; stipules broad at the base with scarious margins, acuminate at the apex, hairy within. Flowers large, white, scented, in large corymbose, terminal, peduncled cymes; bracts stipuliform, the lower sometimes leafy; bracteoles laciniate. Calyx ·12″ long, pubescent; triangular, acute. Corolla-tube slender, glabrous, 1″-1·2″ long, slightly dilated upwards; lobes oblong, apiculate, less than ½ the length of the tube. Style exserted for 1·5″-2″; stigma scarcely distinguishable, from the style not fusiform. Fruit size of a pea, globose or sometimes didymous, smooth, grey-purple, shining.

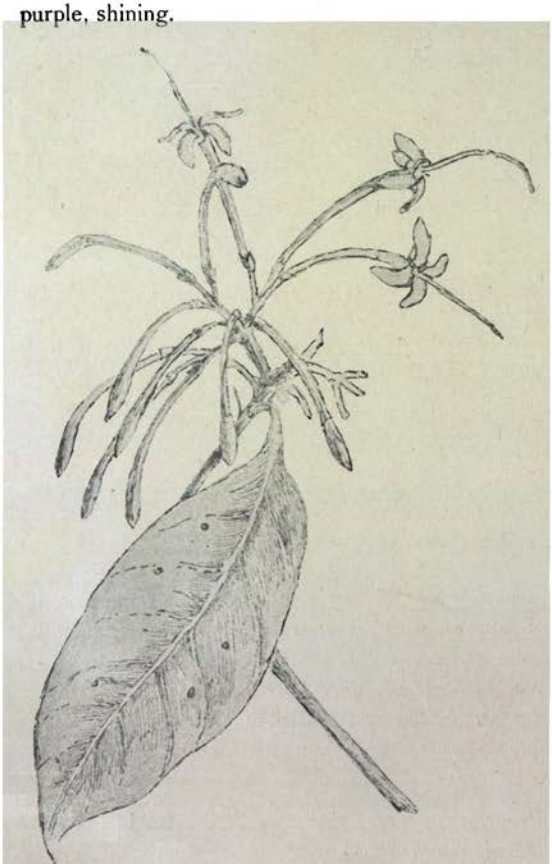

Fig 355. Pavetta hispidula, W. & A.

Western peninsula on the ghâts from the Konkan southwards. In rain-forest on the Supa ghâts of North Kanara, rare. Fl. May. Fr. R. S. A slender-branched shrub.

17. COFFEA, L.

Shrubs. Leaves simple, opposite, rarely in whorls of 3; stipules broad, free. Flowers white, solitary in pairs or in axillary fascicles or cymes. Calyx-tube short with a truncate or dentate limb. Corolla-lobes 4-7, spreading, twisted in bud. Ovary 2-celled; style bifid at the top; ovule 1 in each cell, peltately attached. Fruit with two plano-convex, inwardly ventrally grooved seeds; albumen horny; cotylédons foliaceous.

C. arabica, L.; Fl. Br. I. 3, 153; Brandis For. Fl. 276; Bedd. Fl. Sylv. 13-48; Dalz. & Gibs. Bomb. Fl. Suppl. 44. *Coffee. Boon*, M.; *Kawa,* Vern.

Indigenous in Abyssinia and the Soudan; cultivated throughout the

presidency, but nowhere on a large scale. Fl. March. Fr. Oct.-Jany. In Mysore thrives well at an altitude of 4000′ and under a rainfall of 80″-100″. Wood white, moderately hard and close-grained.

18. MORINDA, L.

Shrubs or trees, usually erect, sometimes climbing. Leaves opposite, usually membranous; stipules connate, sheathing. Flowers white, sessile, on a globose receptacle, more or less connate by the calyces. Calyx-tube short; limb short or O. Corolla tubular; lobes 4-7, coriaceous, valvate in bud. Stamens inserted in the mouth of the corolla; filaments short. Ovary 2 or spuriously 4-celled; cells 1-ovuled; style slender with 2 long or short stigmatic branches. Fruit a compound, succulent berry or syncarpium containing a number of hard, cartilaginous, 1-seeded pyrenes, 2-4 from each flower. Seeds obovoid or reniform; albumen fleshy or horny; embryo terete; radicle inferior.

Leaves glabrous, shining ... . 1. M. citrifolia.

Leaves usually pubescent or tomentose, not shining... 2. M. tinctoria.

1. M. citrifolia, Linn.; DC. Prodr. IV. 446; Fl. Br. I. 3, 55; Dalz. & Gibs. Bomb. Fl. 114; Brandis For. Fl. 277; Bedd. Fl. Sylv. t. 220; Cooke Fl. Pres. Bomb. 1, 612; Gamble Ind. Timb. 422. *Aval, bartundi,* Vern.; *Aak,* M.; *Ainshi, mulgul,* K.

A small, glabrous tree; branchlets obtusely 4-angled. Leaves elliptic, 5″-8″ by 3″-4″, acute or acuminate at the apex, narrowed into the petiole at the base, bright-green, shining, glabrous, one of the pair at the base of the peduncle often suppressed; lateral-nerves 8-10 pairs, strong beneath; petioles ·5″-·75″ long; stipules large, broad, obtuse, connate, semilunar or 2-3-fid, membranous. Flowers 5-merous, white, usually in solitary leaf-opposed, peduncled heads more than 1″ in diameter; peduncles 1″-1·5″ long. Calyx-limb truncate. Corolla-tube infundibuliform, ·3″-·5″ long, hairy at the mouth; lobes lanceolate, acute. Stamens with hairy filaments; anthers ½-exserted. Fruit irregularly globose, consisting of many coalesced drupes, white, about 1″ in diameter; pyrenes concavo-convex, winged on the margins.

Var. *bracteata,* Fl. Br. I. 3, 156 differs from the type, having the anthers included in the hairy mouth of the corolla-tube. The calyx-limb is also often furnished with a white, foliaceous lobe, often ·5″ long.

"Throughout the hotter parts of India and Ceylon, cultivated and wild." Fl. Br. I.

Var. 1, *citrifolia* proper, cultivated. Var. 2, *bracteata,* is common along

the coast of the Konkan, quite near the sea, and certainly indigenous; it is the *Cada Pelara* of Rheede, Hort. Mal. 1, f. 52. Fl. and Fr. R. S.

2. M. tinctoria, Roxb. Hort. Beng. 15; Fl. Br. I. 3, 156; Brandis For. Fl. 277; Cooke Fl. Pres. Bomb. 1, 614; Gamble Ind. Timb. 422; *M. citrifolia*, Bedd. Fl. Sylv. t. 220; *M. tomentosa*, Dalz. & Gibs. Bomb. Fl. 114. *M. multiflora*, Roxb.; Brandis For. Fl. 227; *M. exserta*, Brandis For. Fl. 276. *Al, ack, alleri, alladi, ainshi,* Vern.; *Mulgal,* K.; *Ali,* Dangs.

Fig 356. Morinda tinctoria, Roxb.

A small or middle-sized tree, usually pubescent or tomentose; branchlets grooved, 4-angled. Leaves elliptic-obovate or lanceolate, 2″-8″ by 1″-4″, acute or shortly acuminate at the apex, narrowed into the petiole at the base, membranous

or thinly coriaceous, more or less tomentose on both surfaces, not shining; one of the pair beneath the penducle often wanting; petioles ·5″-1″ long; stipules acute or often bifid with acute lobes. Flowers white, sweet-scented, 5-merous, in globose heads or in short, terminal, trichotomous panicles; peduncles ·5″-1″ long, solitary, tomentose, in the axil of a small, linear, leafy bract. Calyx-tube truncate; limb rarely expanded into an oblong, veined lobe about ·5″ long. Corolla-tube tomentose, ·5″-·75″ long. Anthers exserted or included. Fruit an irregularly globose or ellipsoid, fleshy syncarpium about ·75″ in diameter.

Throughout tropical India and Ceylon, usually in dry forests, Bengal, Burmah, Guzerat and Southern India.

Var. 1, *tinctoria* proper, is cultivated in this presidency principally in Khandesh for its valuable dye. Var. 2, *tomentosa*, common in the deciduous forests of the presidency. Fl. May. Fruit ripe June-July.

Bark corky, brown, with longitudinal fissures. Wood red, often yellow and sometimes with red streaks, moderately hard, close-grained. Annual-rings usually faint. Pores small, scanty, generally in radial lines between the numerous fine and moderately broad medullary rays. Wood durable, made into plates and dishes. Bark yields a red and yellow dye much used for carpets etc.

19. PSYCHOTRIA, L.

Erect, usually evergreen shrubs or small trees, rarely climbers. Leaves petioled, attenuated at the base; stipules solitary or in pairs, often with glandular hairs. Flowers in terminal, corymbose cymes, bracteate or not. Calyx-tube short; limb often deciduous. Corolla-tube short, straight; throat hairy or glabrous; lobes usually 5, valvate in bud. Anthers included or exserted. Ovary 2-celled; cells 1-ovuled. Fruit small, ovoid, globose or oblong, rarely didymous, with 2 plano-convex, 1-seeded pyrenes, rarely separating into 2 cocci; endocarp thin. Seeds plano-convex, ventrally flat or grooved; albumen hard, sometimes ruminate; embryo small, basal; cotyledons broad; radicle inferior.

Seeds plano-convex; albumen ruminate.
Cyme-branches mostly whorled.
Flowers mixed with rufous hairs.
Stipules small ... ... 1. P. Thwaitesii
Flowers not mixed with rufous hairs.
Stipules large.
Cymes congested, branches short. Fruit not crowned with the enlarged calyx ... 2. P. truncata.

Cymes with long, stout, white branches.
Fruit crowned with the enlarged calyx.
Seeds with 1 dorsal ridge ... ... 3. P. Dalzellii.
Cymes-branches mostly opposite, bright-yellow in fruit. Seeds with 1 or O dorsal ridge 4. P. flavida.
Seeds sharply dorsally ridged; albumen equable.
Cyme-branches opposite or whorled. Seeds dorsally 1-ridged ... ... 5. P. canarensis.
Cyme-branches opposite. Seeds dorsally 4-ridged ... ... 6. P. octosulcata.

1. P. Thwaitesii, Hook. f.; Fl. Br. I. 3, 162; Cooke Fl. Pres. Bomb. 1, 615; Trimen Fl. Ceyl. 2, 358.

A large, gregarious shrub; branchlets smooth, usually grooved. Leaves elliptic-lanceolate, or oblong-lanceolate, 4″-8″ by 1·5″-3″, acute or acuminate at the apex, gradually attenuate at the base into the petiole, thinly coriaceous, dark-green, glabrous; lateral-nerves about 15 pairs, prominent on both sides; petioles ·25″-·1″ long; stipules short with a broad base and a long, subulate point at the apex, rufous-ciliate on the margins. Flowers sessile, mixed with short, rufous hairs, greenish, small, in terminal, rounded, capitate heads, solitary and shortly pedunculate or in short, peduncled cymes with glabrous, whorled branches; bracts stipuliform with irregular, membranous, jagged margins and a hard, long terminal point; bracteoles reduced to dense, rufous, crisped or straight hairs. Calyx very short; limb nearly truncate. Corolla-tube short with a few hairs at the mouth. Fruit a globose, pisiform berry, crowned with the calyx-limb, black shining; pyrenes hemispherical, tubercled without furrows.

Western peninsula, on the ghâts from the Konkan southwards to Ceylon, 1-6000′, common. On the southern ghâts of North Kanara in rain-forest, common near the Nilkund and Gairsoppah ghâts at about 2000′. Fl. Mch.-Apl. Fr. ripe Nov.-Dec.

2. P. truncata, Wall. in Roxb. Fl. Ind. 2, 162; Fl. Br. I. 3, 163; Cooke Fl. Pres. Bomb. 1, 616; *Grumilea vaginans,* DC.; Dalz. & Gibs, Bomb. Fl. 111.

A large, erect, bushy shrub; branches flattened, glabrous. Leaves broadly obovate or lanceolate, 3·5″-7″ by 1·25″-3″, shortly, abruptly acuminate at the apex, gradually attenuate into the petiole at the base, thinly coriaceous, dark-green above, pale beneath, usually quite glabrous on both sides; lateral-nerves about 15 pairs, parallel, curved upwards, strong and prominent on both sides with hollow glands in the axils; petioles ·25″-·5″ long, stout; stipules large, 1″ long or longer, acute at the apex, with a broad sheathing base, very caducous.

Flowers shortly pedicelled, white in short, broad, many-flowered, terminal cymes with whorled branches; branches of the inflorescence and flowers waxy-white. Calyx about ·1″ long, broadly campanulate, truncate on the margins. Corolla-tube ·1″ long, cylindrical, glabrous or with a few hairs outside, hairy at the mouth; lobes as long as the tube, ovate, sub-acute. Fruit globose, ·4″ in diameter, black, fleshy, distinctly crowned with the broad calyx-limb; pyrenes plano-convex, smooth; albumen ruminated.

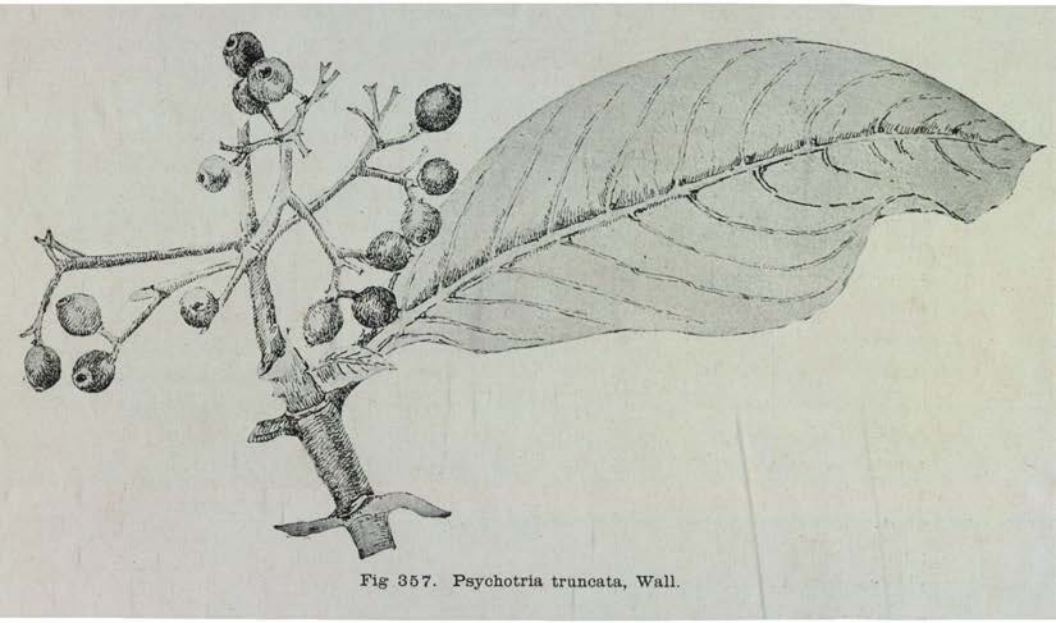

Fig 357. Psychotria truncata, Wall.

Western peninsula on the ghâts from the Konkan southwards. In the rain-forests of the Konkan and North Kanara ghâts; common near the Tinai ghàt; on the laterite at Mahableshwar (4500′ alt.) Fl. Jany. Fr. ripe Oct.

3. P. Dalzellii, Hook. f.; Fl. Br. I. 3, 163; Cooke Fl. Pres. Bomb. 1, 616. *Shivan-yallaki, fatpate, dutiyale,* K.

A large, usually gregarious evergreen glabrous shrub; branchlets green, terete, somewhat flattened, striate. Leaves obovate-oblong or oblanceolate, 4″-8″ by 1·75″-3″, rounded and shortly apiculate at the apex, gradually narrowed into the petiole at the base, thick, coriaceous, dark-green, shining above, paler beneath, drying yellow; lateral-nerves about 15 pairs, prominent beneath; petioles stout, ·25″-1″ long; stipules ·75″ long, broad at the base, acuminate, deciduous. Flowers white, 2-5 together, sessile at the ends of the branches in terminal,

peduncled cymes 3″-6″ long; lower cyme-branches 3-5 together in 1-2, distant whorls, 1″-2″ long; lowest pair of bracts large, thick, acute at the apex, with a broad base, often nearly 1″ long; bracteoles at the bases of the whorl-branches broad, ovate, with ciliate margins; upper bracteoles surrounding the flowers like an involucre. Calyx glabrous, ·2″ long, broadly campanulate; lobes rounded or emarginate at the apex; margins membranous, ciliate. Corolla-tube short, densely bearded at the throat; lobes ovate-oblong, acute. Fruit globose, ·4″ in diameter, black, shining, succulent, crowned with the calyx-tube; pyrenes plano-convex, rough, with a conspicuous dorsal ridge; albumen ruminate.

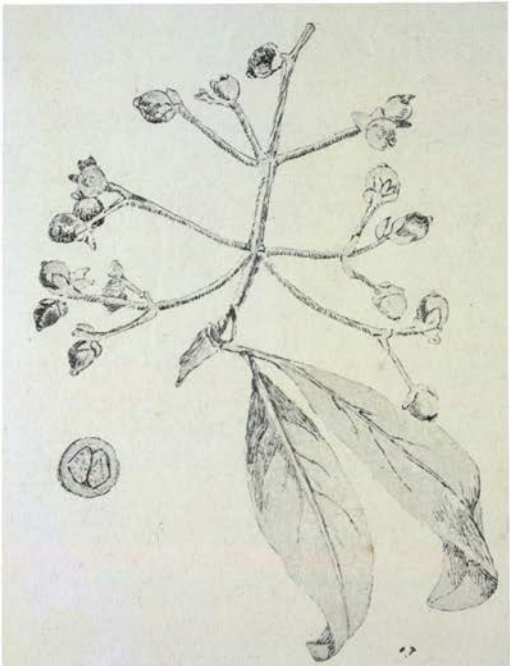

Fig 358. Psychotria Dalzellii, Hook, f.

Western peninsula from N. Kanara southwards; throughout the rain-forests of North Kanara; apparently endemic in the Southern Konkan and N. Kanara; very common, often gregarious on the ghâts near Yellapur. A large shrub. Stem 2″ in diameter at the base and 20′ high, not much branched. Bark smooth; inner-bark soft, white. Green-cells developed. Wood white, tough. Fl. June-July. Fr. Jany.-Mch.

4. P. flavida, Talb. List of trees, (1894) 113; Cooke Fl. Pres. Bomb. 1, 617. *Shivan-yallaki, tutputte*, K.

A small, evergreen, shrub; branchlets terete, glabrous. Leaves elliptic-oblong, 4″-10″ by 2″-4″, abruptly, shortly acuminate at the apex, cuneate at the base, thinly coriaceous, glabrous; lateral-nerves about 12 pairs strong beneath, with hollow, axillary glands; petioles ·25″-·5″ long; stipules ovate-acuminate, deciduous. Flowers numerous, small, white, in terminal, peduncled cymes 1″-2″ long; cyme-branches opposite, flattened, shorter than the peduncle; bracts leafy, deciduous, shorter than the leaves. Calyx short, truncate or very shallowly toothed. Corolla ·1″ long; tube very short, densely villous at the throat. Fruit ellipsoid, ·25″ in diameter, compressed, black, scarcely pulpy, crowned with the

calyx-tube; pyrenes plano-convex with a narrow dorsal ridge; albumen strongly ruminate. The cyme-branches turn a bright-yellow in fruit.

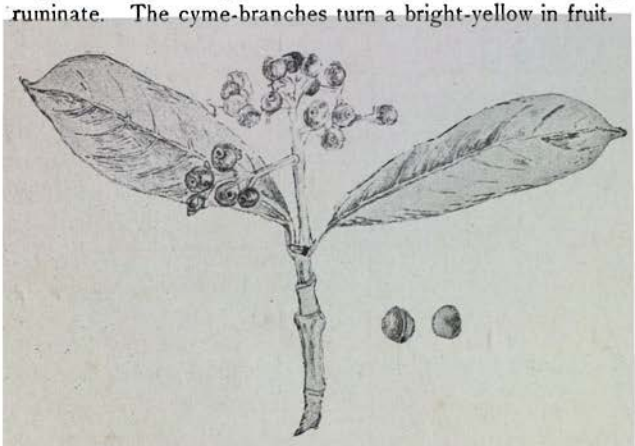

Fig 359. Psychotria flavida, Talb.

A small shrub, common in the rain-forests on the southern ghàts of North Kanara and apparently endemic. Fl. May-July. Fr. Jany.-Mch. The bright-yellow fruiting cymes are characteristic. This species is closely allied to *P. nudiflora*, W. & A. but differs in having a densely hairy, short corolla-tube, that of *P. nudiflora* being long and glabrous.

5. P. canarensis, Talb. List of Trees, (1894) 113. Jour. Bomb. Nat. Hist. Soc. XI. 692. t. 12; Cooke Fl. Pres. Bomb. 1, 617; Brandis Ind. Trees, 395.

A small erect shrub with smooth branches. Leaves ovate, obovate, or lanceolate, 2″-5″ by ·5″-1·75″, acute, attenuate at the base, thin, nearly glabrous, minutely punctate and pale beneath; lateral-nerves 8 pairs, distinctly looping within the margin; petioles ·25″ long; stipules short, acute, caducous. Cymes few or many-flowered, mostly terminal, 1″-3″ long; branches opposite or verticellate, slender, as long as or longer than the peduncle. Flowers small, sessile; bracts and bracteoles minute, linear, caducous. Calyx short, tubular, 4-toothed. Corolla white, tubular or slightly funnel-shaped, about ·12″ long; limb with 4 spreading or reflexed lobes; mouth of the corolla densely hairy. Stamens at the mouth of the tube; filaments very short. Ovary 4-lobed; style as long as the corolla-tube. Fruit ovoid, curved, black, shining, ridged, about ·5″ long, crowned with the toothed calyx. Seeds ridged along the back, ventrally flat; albumen equable.

Fairly common and apparently endemic in rain-forest near the falls of Gairsoppah, North Kanara. Flowers R. S. Fruit ripe C. S. Dec.-Jan.

6. P. octosulcata, Talb. Jour. Bomb. Nat. Hist. Soc. XI. 237. t. 7; Cooke Fl. Pres. Bomb. 1, 617; Brandis Ind. Trees, 395.

An erect, stout, smooth-barked shrub with green, glabrous branches. Leaves obovate or oblanceolate, abruptly acuminate, shining above, pale beneath,

Fig 360. Psychotria canarensis, Talb.

thin; blade 3″-6″ by 1″-2″; lateral-nerves 7-10 pairs, prominent, parallel, usually with small saccate glands in the axils beneath; petioles ·2″-·5″ long; stipules connate at the base, long or shortly acuminate, deciduous. Flowers white, in short, terminal, corymbose cymes 1″-2″ long; branches opposite. Calyx minute,

Fig 361. Psychotria octosulcata, Talb.

cup-shaped, 5-toothed. Corolla ·1″ long; tube hairy at the mouth. Fruit obovoid,

straight or slightly curved, 8-ridged, black and succulent when ripe, but soon drying and becoming regularly ridged with a flattened top. Seeds 2, black, rough, each dorsally 4-ridged, ventrally flat, ·5″ long; albumen equable, horny. A large, gregarious, branched shrub, 10′-20′ high with stem 1″-2″ in diameter at the base.

Common in the undergrowth of some of the rain-forests of the Siddapore and Sircy sub-divisions of North Kanara, apparently endemic. Fl. R. S. Fr. C. S.

20. CHASALIA, Comms.

Shrubs or small trees Leaves opposite, or ternately whorled; stipules intrapetiolar, subpersistent, usually bifid. Flowers small, dimorphic, in terminal cymes Calyx-tube ovoid or subglobose; limb truncate or shallowly toothed, persistent. Corolla-tube dilated above, usually curved and bearded or naked at the throat; lobes 5, much shorter than the tube, valvate. Stamens with short or obsolete filaments and long, sagittate anthers. Disk large, annular or tumid. Ovary 2-celled; cells each with one ascending ovule; style long, exserted or included, 2-divided. Fruit dry or somewhat fleshy, with 2, very thin, pyrenes, concave on the ventral surface (crescent-shaped in section); albumen horny, not ruminate.

Fig 362. Chasalia curviflora, Thw.

C. curviflora, Thw. Enum. 150, 421; Fl. Br. I. 3, 376; Cooke Fl. Pres. Bomb. 1, 618; Gamble Ind. Timb. 424. *Psychotria longifolia,* Dalz. in Hook. Lond. Jour. Bot. 2, 133. *Kan-mullige-gidda,* K.

A slender shrub; branchlets compressed, glabrous. Leaves elliptic or oblong-lanceolate, 3″-7″ by 1″·2·5″, acute or shortly acuminate at the apex, gradually tapering at the base, thin membranous, glabrous, shining above, paler beneath; lateral-nerves 8-10 pairs, curved upwards, distinct on both sides; petioles ·25″-1″ long; stipules short, broad at the base and bifid at the apex. Flowers sessile, in trichotomously branched, peduncled, terminal cymes 1·5″-2″ long; peduncles waxy-white, 1″-2″ long; bracts subulate or long acuminate, persistent; bracteoles small, subulate. Calyx glabrous, ·08″ long; teeth triangular, acute, greenish, very small. Corolla-tube waxy-white with a yellow throat, hairy within, slender, curved, sometimes nearly ·75″ long; lobes ·1″ long, oblong, obtuse. Fruit size of a pea, didymous or depressed-globose, black-purple, fleshy, crowned with the calyx-limb; pyrenes thin, dorsally compressed.

Eastern Himalaya, Sikkim 2-6000′, Assam, Cachar, Malay peninsula, Ceylon; Western peninsula from Bombay southwards; in the rain-forests of North Kanara and the Konkan, common. Fl. May-Aug. Usually a small shrub. The waxy-white, slender, curved, tubular flowers with a yellow throat are characteristic.

21. LASIANTHUS, Jack.

Shrubs or small trees, often fœtid. Leaves opposite, distichous; stipules interpetiolar, broad. Flowers small, in axillary, bracteate clusters, cymes or heads. Calyx-tube short; limb 3-7-toothed, persistent. Corolla-tube funnel-shaped; throat villous; lobes 3-7, valvate in bud. Stamens 4-6 on the corolla-throat; filaments short. Ovary 4-9-celled with 1 erect basal-ovule in each cell; style short or long; arms 3-9, short, obtuse. Drupe small with 4-9 triquetrous, 1-seeded pyrenes; seeds narrow-oblong; testa membranous; embryo terete; radicle inferior, slender.

Cymes sessile. Corolla hairy without. Drupe black ... 1. L. sessilis.

Cymes peduncled. Corolla glabrous without. Drupe blue 2. L. venulosus.

1. L. sessilis, Talb. List of Trees, etc. (1894) 114; Cooke Fl. Pres. Bomb. 1, 620; Gamble Ind. Timb. 425; Brandis Ind. Trees, 397.

A stout, large, evergreen shrub, branched from the base; branchlets green, adpressed-hairy. Leaves opposite, elliptic-acuminate, 2″-5″ by 1″-2″, rounded or acute at the base, coriaceous, glabrous, shining above, paler and hairy on the lateral-nerves beneath; lateral-nerves 6 pairs, very prominent beneath, strongly curved upwards; the midrib prolonged in a short, hairy point at the acuminate apex of the leaf; veins sinuate, parallel, at right angles to the nerves; petioles ·25″ long, hairy; stipules short, broad at the base, acuminate at the apex, hairy.

Flowers white, sessile, axillary, fascicled: bracts triangular, hairy; bracteoles subulate, hairy. Calyx-tube very short, black-hairy outside: teeth 4, triangular, ciliate on the margins. Corolla tubular, ·1″ long, slightly hairy outside, villous within; limb 4-lobed; lobes as long as the tube, triangular, valvate, spreading. Stamens in the throat of the corolla, nearly sessile. Ovary 4-celled; cells 1-ovuled; style with 4, thick, spreading branches. Fruit a bluish-black, fleshy drupe, size of a pea, crowned with the persistent hairy calyx-teeth, with 4, triangular, dorsally tubercled pyrenes which are surrounded with a sweet, white, edible pulp. Fruit and leaves more or less fœtid when crushed.

Fig 363. Lasianthus sessilis, Talb.

A stout gregarious evergreen shrub usually branched from the base, nearly allied to *L. strigosus*, Wight. but differing in the calyx-teeth and nervation or leaves. In the rain-forests of North Kanara from Yellapur southwards to Gair-

soppah, common and often gregarious in the undergrowth in some of the kans. Fl. Aug.-Sept. Fr. Oct.-Feb.

2. L. venulosus, Wight in Calc. Jour. Nat. Hist. VI, 508; Fl. Br. I. 3, 190; Gamble Ind. Timb. 425; Cooke Fl. Pres. Bomb. 1, 621; *Santia venulosa,* W. & A. Prodr. 422; Dalz. & Gibs. Bomb. Fl. 114.

A large, robust, nearly glabrous shrub. Leaves elliptic-oblong, acute or acuminate, 1·5″-3·75″ by ·6″-1·5″, glabrous above, hairy on the midrib and venation beneath; lateral-nerves 6-8 pairs, prominent above and below; petioles ·12″ long; stipules triangular, hairy. Flowers yellowish-white, few, in short-peduncled cymes; pedicels and bracts hairy. Calyx ·2″ long, hairy; teeth 4-5, linear-subulate. Corolla ·3″ long; tube glabrous outside; throat hairy. Stamens 4-5; style 3-5-branched. Drupe globose, ·15″ in diameter, blue, crowned with calyx-lobes; pyrenes 3-5.

"On the ghâts but very rare." Dalz. This evergreen shrub is a native of the Nilgiris above 5000′, common in the sholas near Coonoor and Ootacamund; it is very doubtfully indigenous in the Bombay presidency. There are no specimens in Dalzell's herbarium at Kew and it has not been found within the limits of this presidency by any collector since Dalzell's time.

22. SAPROSMA, Blume.

Fœtid shrubs, often with bristles at the ends of the branches. Leaves opposite or 3-4-whorled, membranous; stipules interpetiolar, connate, 1-3-cuspidate, deciduous. Flowers sessile, small, axillary or terminal; bracts and bracteoles minute, often connate. Calyx-tube obconic; limb 4-6-divided, persistent. Corolla with a villous throat; lobes 4-5, valvate. Stamens 4-5 in the throat of the corolla; filaments short or O. Ovary 2-celled; ovule 1 in each cell erect, basal; style filiform with two short arms. Drupe with 1-2, crustaceous pyrenes. Seeds ellipsoid and solitary or 2 plano-convex; testa membranous; radicle slender, inferior; cotyledons small.

S. indicum, Dalz. & Gibs. Bomb. Fl. 112; Fl. Br. I. 3, 192; Cooke Fl. Pres. Bomb. 1, 619.

A large shrub; branches dichotomous, pale, glabrous, shining, widened and flattened below each node. Leaves very shortly petioled, ovate, 2″-4″ by ·75″-1·5″, acute or shortly acuminate at the apex, rounded or acute at the base, thinly coriaceous, glabrous; lateral-nerves 8-10 pairs; stipules short, 1-3-cuspidate, smooth, white, shining, caducous. Flowers terminal, 1-3 together, shortly pedicelled at the ends of the twigs between the last pairs of leaves; pedicels short, with a whorl of connate, scaly bracteoles at the base. Calyx cup-shaped, short, unequally 4-5-toothed; teeth narrowly triangular. Corolla ·2″ long, white; lobes

as long as the tube, ovate, acute. Fruit an ellipsoid berry ·3″-·5″ long, bright-blue, fœtid and fleshy, crowned with the calyx-tube, usually 1-seeded; seeds flattened, subglobose, ·1″ in diameter.

Western peninsula on the ghâts from Bombay southwards. In the rain-forests of the Konkan and North Kanara; common on the Siddapore ghâts of North Kanara. Fl. C. S. Fr. ripe March.

23. HAMILTONIA, Roxb.

A hispid, pubescent or glabrate, trichotomously branched under-shrub. Leaves opposite, petioled, many-nerved; stipules intrapetiolar, short, acute, persistent. Flowers small, in large, trichotomous panicles. Calyx-tube ovoid; limb 5-divided; teeth persistent. Corolla funnel-shaped; tube long; lobes 5, valvate. Stamens 5, inserted in the throat of the corolla. Ovary 5-celled and furrowed; style filiform; arms 5, linear. Capsule 1-celled from the absorption of the septa, 5-seeded. Seeds triquetrous; outer coat of testa reticulate, 3-valved at the base; inner coat thick; cotyledons foliaceous, cordate; radicle inferior, terete.

H. suaveolens, Roxb. Hort. Beng. 15; Fl. Ind. 1, 554; Fl. Br. I. 3, 197; Brandis For. Fl. 278; Bedd. For. Man. in Fl. Sylv. 134-12; Cooke Fl. Pres. Bomb. 1, 621; Gamble Ind. Timb. 425; *H. mysorensis,* Wight & Arn. Prodr. 423; Dalz. & Gibs. Bomb. Fl. 115. *Gidesa, gidasawa,* Vern.

An erect, much branched, pubescent shrub or small tree, often gregarious; branches more or less herbaceous. Leaves elliptic-lanceolate, fœtid when bruised, 3″-8″ by 1″-3·5″ acute at both apex and base, stiff, coriaceous, glabrous or pubescent above, pubescent on the nerves and pale beneath; lateral-nerves about 12 pairs, curving upwards, prominent beneath; petioles ·1″-·5″ long; stipules broad-triangular, acute, pubescent. Flowers usually white, sessile or nearly so, in many-flowered heads about ·75″ in diameter, arranged in large, terminal, trichotomous, pubescent, leafy panicles; bracts leafy, narrowed, diminishing in size towards the top of the panicle; bracteoles minute, subulate. Calyx-tube narrow, hairy, ·1″ long; teeth as long as or longer than the tube, linear, acute, pubescent. Corolla-tube slender, slightly dilated at the top, ·25″ long or sometimes longer, pubescent outside; lobes ovate, acute, usually much shorter than the tube, glabrous inside. Capsule 1-celled, ellipsoid, ·2″ long, opening at the apex into 5 valves; seeds triquetrous with a thin reticulate, loose testa.

Tropical and sub-tropical Himalaya, from Kashmir to Bhutan, 2-5000′, Central and Western India, Behar to Mysore, common on the Konkan ghâts also in North Kanara on the highest hills of the Supa taluka. Fl. Oct.-Feb.

Bark grey, shining. Wood soft and porous. Described by Gamble as a beautiful plant with panicles of blue flowers. In this presidency near Panchgani, Mahableshwar and elsewhere the flowers are usually white.

Fig 364. Hamiltonia suaveolens, Roxb.

Order LII.—COMPOSITÆ.

Herbs or shrubs, rarely trees. Leaves usually alternate, rarely opposite or whorled; stipules O. Inflorescence centripetal, capitate, bracteate on the receptacle which is either naked or clothed with hairs, scales or bristles between the flowers. Flowers all tubular *(head discoid)*, or the outer or all ligulate *(head rayed)*, all 2-sexual or the inner 2-sexual or male, the outer female or neuter, sometimes dicœcious. Calyx superior; limb O or of hairs *(pappus)* or scales. Corolla of two forms either tubular or campanulate, 4-5-lobed; lobes valvate ligulate; lobes elongate and connate. Disk epigynous. Stamens 4-5; filaments usually free; anthers connate; connective produced; cells simple or tailed at the base. Ovary 1-celled; style slender, 2-fid; ovule solitary, basal, erect. Fruit a dry achene, usually crowned with the calyx *(pappus)*; albumen O.

VERNONIA, SCHREB.

Herbs and shrubs, climbers or rarely small trees. Leaves alternate. Heads axillary or terminal, homogamous, solitary, cymose or panicled. Involucre ovoid or globose, equalling or shorter than the flowers; bracts in many series, the inner longest. Corollas equal, tubular, slender; lobes 5, linear. Anther-bases obtuse. Style-arms subulate, hairy. Achenes usually ribbed or angled; pappus of many hairs, often with an outer row of flattened, short hairs or bristles.

Undershrubs or herbs.
- Leaves without dense white-cottony tomentum beneath.
  - Flower-heads small, in dense rounded corymbs — 1. V. divergens.
  - Flower-heads large, in open spreading corymbs — 2. V. ornata.
- Leaves etc. with dense, white-cottony tomentum.
  - Flower-heads small, in broad branched corymbs — 3. V. indica.

A moderate-sized, tomentose tree ... ... 4. V. arborea.

1. V. divergens, Benth. in Gen. Plant. 2, 229; Fl. Br. I. 3, 234; Brandis Ind. Trees, 399; Cooke Fl. Pres. Bomb. 2, 11; *Eupatorium divergens,* Dalz. & Gibs. Bomb. Fl. 123. *Bundar,* Vern.

A perennial undershrub; branches sometimes 6′-8′ long, pubescent. Leaves elliptic-lanceolate, 2″-5″ by 1″-2·5″ acute at the apex, tapering at the base, serrate, thick or thin in texture, scabrid above, more or less pubescent beneath; lateral-nerves about 8 pairs, strong beneath with reticulate venation between; petioles

·1″-·25″ long. Flowers purple; heads small, 8-12-flowered, clustered in dense, corymbose, rounded panicles at the ends of the branches. Involucral-bracts with greenish tips, ovate or oblong-obtuse. Achenes 10-ribbed, glabrous; pappus pale reddish or dirty-white.

Assam, Burmah, Central provinces and the Western peninsula; throughout the presidency in moist monsoon-forest; ascending to 4500′ on the Nasik and Satara ghâts; common on the Mahableshwar plateau and in the jungles near Anjini in the Nasik district. Fl. and Fr. during the C. S.

2. V. ornata, Talb. Jour. Nat. Hist. Soc. Bomb. XI, pl. 13.

A variable herb, sometimes almost an undershrub; branches striate, usually glabrescent. Leaves obovate-oblong, 8″-2·5″ by 3″-1″, long-acuminate at the apex, gradually tapering at the base, coarsely serrate, thin, dark-green above, paler beneath, sparsely glandular-hairy above, pubescent and glandular, particularly on the nervation beneath; lateral-nerves about 10 pairs, slender, prominent, with distinct reticulate venation beneath; petioles ·25″-·5″ long. Flower-heads 20-25-flowered, purple, ovoid, about ·75″ long, in open, spreading, terminal or axillary, corymbose cymes as long as the leaves. Involucral-scales scarious, linear-lanceolate, acute or apiculate, pubescent, green at the apex; lower smallest, increasing in length upwards to ·5″. Seed ·1″ long, strongly 10-ribbed, minutely hairy between the ribs; pappus-hairs reddish, twice as long as the seed, minutely barbed, lowest row shortest.

A stout erect, leafy, handsome-flowering annual, common in rain-forest and in open places near the falls of Gairsoppah and elsewhere on the N. Kanara ghâts; allied to *V. saligna,* DC. var. *nilghirensis.* Fl. and Fr. during the C. S.

3. V. indica, C. B. Clarke Comp. Ind. 16; Fl. Br. I. 3, 238; Cooke Fl. Pres. Bomb. 2, 11.

An undershrub; branches terete, covered with white-woolly tomentum. Leaves elliptic-oblong, 3″-6″ by 1·5″-4″, acute at the apex and base, sharply serrate, coriaceous, scaberulous above, densely white-tomentose beneath; lateral-nerves 8-10 pairs, strong beneath; petioles very short or O. Flower-heads 6-10-flowered, small, crowded at the ends of long, stout branches, forming large terminal bracteate, corymbose panicles; bracts ovate-lanceolate, white-tomentose beneath, scaberulous above, in the axils of the cyme-branches. Involucral-bracts elliptic, obtuse, purple-tipped, black-mucronate, densely white-tomentose; outer shorter. Corolla purple, glabrous. Achenes 10-ribbed, about ·1″ long; pappus yellowish, twice as long as the achene.

Western peninsula from the Konkan to Travancore in monsoon-forest; on the Mahableshwar plateau at 4500′; common in moist forests throughout the presidency. Fl. and Fr. during the C. S.

Fig 365. Vernonia ornata, Talb.

4. V. arborea, Ham. in Trans. Linn. Soc.; Fl. Br. I. 3, 239; *V. javanica,* DC.; Bedd. Fl. Sylv. 135; Var.? *Wightiana*; *Monosis Wightiana,* DC.; Bedd. **Fl.** Sylv. t. 226.

Assam, Silhet, Burmah, Tenasserim, Malacca; Western peninsula from the Bababudan hills southwards; Ceylon, ascending to 5000′. On the W. ghâts from the Konkan southwards. (Fl. Br. I.).

A large or small tree with tomentose branches and inflorescence. Flowers white or pale-violet appear during Feb.-Mch. I have not met with this arborescent species either in N. Kanara or the Konkan; it is cultivated in gardens near Bombay, having been introduced probably from Bengal.

Order LIII.—GOODENIACEÆ.

Shrubs or herbs. Leaves alternate or radical; stipules O. Flowers bisexual, axillary or terminal, racemed or panicled, irregular. Calyx-tube adnate to the ovary or rarely free; limb 5-fid or nearly obsolete. Corolla-lobes 5, valvate in bud. Stamens 5, inserted at the base of the corolla and alternate with its lobes; anthers free or connate in a ring round the style. Ovary usually inferior, 1-2-celled; style simple, with a cup-shaped indusium including the stigma; ovules in each cell, one or many on the dissepiment. Fruit a drupe or capsule. Seeds albuminous; embryo straight; radicle next the hilum.

SCÆVOLA, LINN.

Littoral shrubs. Leaves alternate, entire or toothed; stipules O. Flowers axillary, bracteate, in short cymes or solitary. Calyx-tube adnate to the ovary. Corolla gamopetalous, oblique, split at the base behind; lobes digitately spreading. Anthers free. Ovary usually inferior, 1-2-celled, with two erect ovules; style-indusium cup-shaped, enclosing the 2-lobed stigma. Fruit a fleshy drupe; endocarp woody or bony.

Calyx-lobes linear-lanceolate, enlarged in fruit.
Drupe white ... ... 1. S. Kœnigii.
Calyx-lobes very short, obtuse or subobsolete.
Drupe purple ... ... 2. S. Lobelia.

1. S. Kœnigii, Vahl. Symb. III, 36; Fl. B. I. 3, 421; Cooke Fl. Pres. Bomb. 2, 69; Gamble Ind. Timb. 428; *S. Taccada,* Dalz. & Gibs. Bomb. Fl. 134. *Bhadrak, bhadraksh,* M.

A large, bushy, littoral shrub; branches cylindrical, stout, greenish, glabrous, shining. Leaves obovate, obtuse at the apex and gradually narrowed at the base, with a woolly tuft in the axil, 6″-9″ by 2″-3″, repand-dentate in the upper part, glabrous, thick, not fleshy; midrib stout; nervation slender. Flowers rather large, white, in axillary cymes shorter than the leaves, with small, woolly bracts in the bifurcations; buds clavate, obtuse. Calyx ·25″ long, pubescent; lobes linear, persistent. Corolla-tube ·75″ long, curved, hairy within; lobes spreading, apiculate, with a thick centre and membranous, irregular toothed, coarsely ciliate margins. Style exceeding ·75″ long, curved, hairy, protruded through the split in the corolla-tube. Indusium-cup at base of the stigma ciliate-hairy. Drupe oblong-

globose, ·75″ long, somewhat lobed, white, succulent, crowned with the calyx-lobes; stone rough, bony.

Fig 366. Scævola Kœnigii, Vahl.

Sea shores of India from Sind to Ceylon, Burmah, Malacca; coast of the Konkan near Ratnagiri; cultivated in gardens, Bombay and Poona. Wood fibrous, soft, coarse and milky; practically useless. Fl. June-Dec.

2. S. Lobelia, Linn.; Fl. Br. I. 3, 420; Cooke Fl. Pres. Bomb. 2, 70; *S. Plumieri,* Vahl.; Trimen Fl. Ceyl. III, 55; *S. uvifera,* Stocks.; Wight. Ic. t. 1613.

A small, branched, littoral shrub. Leaves 1·5″-3″ by ·75″-1·25″, obovate, obtuse at the apex, narrowed gradually to the base, glabrous, entire, fleshy; nervation inconspicuous. Flowers white, in small, axillary, 3-flowered cymes, the central flower sessile; bracts small, fleshy; bracteoles lanceolate. Calyx ·2″ long, truncate. Corolla-lobes linear-oblong, ·25″ long, ⅓ the length of the tube, hairy within. Drupe globose, ·5″ in diameter, smooth, purple.

Sea shores of India in tidal forests from Sind to Ceylon, coasts of Sind and the South Deccan, Ceylon principally in the dry districts; mouths of the Indus near Karachi.

Closely resembles *S. Kœnigii*, but the leaves are smaller and the drupe is purple.

Order LIV—MYRSINACEÆ.

Trees or shrubs, sometimes climbing. Leaves alternate, entire or serrate, usually pellucid gland-dotted. Flowers bisexual or polygamous, small, regular, often with resinous glands, in axillary clusters, racemes or panicles, rarely terminal. Calyx free (in *Mæsa*, adnate to the ovary); limb 4-6-lobed; lobes persistent, often enlarged in fruit. Corolla regular; tube short or O; lobes 3-7, contorted or imbricate. Stamens epipetalous, as many as the divisions of the corolla and opposite to them. Ovary 1-celled, narrowed into the filiform or columnar style; ovules few or many, inserted on the free, central placenta. Fruit an indehiscent berry or drupe (dehiscent in *Ægiceras*), 1-several-seeded. Seeds often with more than one embryo; albumen pitted or ruminate (O in *Ægiceras*); embryo transverse.

Fruit a small, glabrous, many-seeded berry. Calyx enclosing the fruit ... ... 1. Mæsa.

Fruit 1-seeded, indehiscent. Calyx free.

Flowers in axillary fascicles. Corolla with a short tube ... ... 2. Myrsine.

Flowers racemed or panicled. Petals free, imbricate ... ... 3. Embelia.

Flowers in umbels, corymbs or panicles. Petals free, contorted in bud ... ... 4. Ardisia.

Fruit cylindric, curved, dehiscing longitudinally ... 5. Ægiceras.

1. MÆSA, Forsk.

Evergreen trees or shrubs. Leaves entire or serrate, with a system of anastomosing resin-ducts transparent when the dry leaf is wetted or with simple, minute, pellucid dots. Flowers small, white, 1-2-sexual, pentamerous, in simple or compound, axillary racemes, 2-bracteolate. Inflorescence often monstrous, when the flowers are replaced by densely imbricating bracteoles. Calyx $\frac{1}{2}$-inferior; teeth small. Corolla gamopetalous, campanulate; lobes imbricate. Stamens 5; filaments short, inserted on the corolla-tube. Ovary with numerous ovules on a globose placenta; style short; stigma capitate or shortly 3-5-lobed. Berry globose, many-seeded, enclosed in the persistent calyx and crowned with the remains of the style. Seeds minute, angular, albuminous.

Leaves and branchlets glabrous	1.	M. indica.
Leaves and branchlets rusty-tomentose	2.	M. dubia.

1. M. indica, Roxb. Fl. Ind. 1, 558 *(Bæobotrys)*; Fl. Br. I. 3, 509; Dalz. & Gibs. Bomb. Fl. 136; Brandis For. Fl. 283; Bedd. Fl. Sylv. 137; Cooke Fl. Pres. Bomb. 2, 82; Gamble Ind. Timb. 438; *Atki*, M.; *Gudde-hargi*, K.

Fig 367. Mæsa indica, Roxb.

A large, evergreen shrub or small tree; branches slender, glabrous, often with raised, brown lenticels. Leaves ovate-oblong or elliptic-lanceolate, 3″-7″ by 1·25″-3″, acute or acuminate at the apex, rounded or acute at the base, thin, opaque, glabrous (resin-ducts visible, when the dry leaf is wetted); margins regularly or irregularly usually deeply serrate-dentate; lateral-nerves 8-12 pairs, strong beneath; petioles ·5″-1″ long, glabrous, channelled above. Flowers small, in axillary, often branched, glabrous racemes, shorter than the leaves; pedicels filiform, ·1″ long; bracts at the base of the pedicel ovate- acute; bracteoles 2, minute, at the base of the calyx. Calyx-tube shortly campanulate, adnate to the ovary and enlarged in fruit; lobes ovate, obtuse, glabrous, as long as the tube. Corolla white, almost rotate, marked with coloured lines; lobes ovate, obtuse, with slightly crenulate margins. Berries globose, white, size of a small pepper-corn, covered nearly to the apex by the persistent calyx, tipped with the short style; edible; seeds black.

Throughout India from the Himalayas to Ceylon, ascending to 6000′, common; Konkan, North Kanara along the ghâts, abundant in the rain-forests of the Sirsi and Siddapur talukas. Fl. at different times throughout the year.

A small or large shrub. Bark thin, light reddish-brown, lenticellate. "Wood soft, brownish; used for fuel and rough house-posts." Gamble. Leaves used in curries in North Kanara.

2. M. dubia, Wall. in Roxb. Fl. Ind. ed. Carey and Wall. 11, 235; *M. indica,* Var.; Bedd. Fl. Sylv. 137. t. XVIII, 4. fig. 1. only.

A small or large evergreen shrub; branches and young parts densely rufous-tomentose. Leaves ovate-lanceolate, 3″-6″ by 1·25″-2·5″, acute or acuminate at the apex, rounded or acute at the base; margins more or less deeply and distantly serrate-dentate, thin; resin ducts conspicuous; lateral-nerves 10-12 pairs, forked above the middle, strong beneath and rufous-tomentose on both sides of the leaf; petioles ·5″-1″ long, densely rufous-hairy. Flowers small, white, in simple or branched, axillary racemes 1″-2″ long; pedicels, bracts and bracteoles densely tomentose. Calyx and corolla similar to those of *M. indica.* Style short; stigma capitate or lobed. Berry white, ovoid, size of a very small pepper-corn, longitudinally striate, glabrous, crowned with the persistent, hairy calyx-lobes and the short, capitate or divided style.

Western ghâts from the Konkan to Mysore, throughout the evergreen forests of the Konkan and North Kanara. Fl. C. S. Fr. ripe Mch.-Apl.

I have not seen specimens of *M. velutina,* Mez, a new species in Engl. Pflanzenreich 4, 35. Mez describes the fruit as subacute at the apex like those of *M. dubia,* with which species it is closely allied if not identical. The specimens of this plant are in the Leiden herbarium and were collected by Dr. Gibson in the Bombay presidency.

Mez in Engler's Pflanzenreich makes 7 separate species out of *M. indica,* Roxb. on what Brandis (Ind. Trees, 414,) evidently considers very slender grounds. On the other hand Cooke following Beddome unites *M. indica,* Roxb. with *M. dubia,* Wall. These in the opinion of most Indian botanists differ sufficiently to be considered distinct species.

2. MYRSINE, Linn.

Evergreen trees or shrubs. Leaves coriaceous. Flowers small, sessile, polygamous, or diœcious, in dense clusters from the axils of the fallen leaves. Calyx 4-5-lobed, resinous-dotted. Corolla white, deeply 4-5-lobed; lobes imbricate, resinous-dotted. Stamens 4-5, inserted at the base of the corolla-lobes; anthers short. Ovary free, globose, 1-celled; style cylindric; stigmas 2-5, small, sub-

combined or spathulate. Fruit small, globose, red or purple. Seed solitary; albumen pitted; embryo often curved, horizontal.

M. capitellata, Wall. in Roxb. Fl. Ind. ed. Carey and Wall. 11, 295; Fl. Br. I. 3, 512; Brandis For. Fl. 286; Bedd. Fl. Sylv. t. 234; Cooke Fl. Pres. Bomb. 2, 83; Gamble Ind. Timb. 439.

A large shrub or small tree; branchlets thick, rough with the scars of fallen leaves and lenticels. Leaves lanceolate or elliptic-lanceolate, 3″-6″ by ·75″-2″, subacute at the apex, narrowed into the petiole at the base, coriaceous, glabrous, pellucid-punctate; margins entire; venation reticulate; midrib prominent beneath; petioles about ·25″ long. Flowers 5-merous, sessile or very shortly pedicelled, in dense, rounded fascicles along the branches on nodules in the axils of fallen leaves; pedicels slender, glabrous, bracteate at the base. Calyx glabrous, 5-lobed; lobes triangular, ciliolate, persistent. Corolla ·25″ in diameter; lobes spreading or reflexed. Anthers large, nearly sessile in the hermaphrodite flowers, on short filaments in the males. Berry globose, ·3″ in diameter, purple, shining when ripe.

Nepal, Bhutan, Assam and the Khasia mountains, Western and Southern India to Ceylon. In the rain-forests of North Kanara from Ainshi southwards, not common. Fl. Oct.-Nov. Fr. Feb.-Mch.

A small tree. Bark thin, smooth, grey. Wood hard, grey, durable. Pores small, scanty, in short radial lines. Medullary rays broad and distant, dotted with shining, reddish, resinous glands. Weighs about 45 lbs. to the cub. ft.

3. EMBELIA, Burm.

Small trees or shrubs, usually climbers. Leaves entire or toothed; petioles often glandular on the margins. Flowers small, polygamous, often dicœcious, in simple or branched racemes. Calyx free, deeply 5-lobed, persistent. Petals usually 5, distinct, spreading. Stamens 5; filaments more or less adnate to the petals. Ovary ovoid or globose; style cylindric. Fruit small, globose, 1-2-seeded; albumen pitted; embryo curved, transverse.

Flowers 5-merous.
- Inflorescence in terminal panicles. Lateral-nerves indistinct ... ... 1 E. Ribes.
- Inflorescence in axillary racemes. Lateral-nerves distinct and prominent ... ... 2. E. robusta.

Flowers 4-merous ... ... 3. E. viridiflora.

1. E. Ribes, Burm. Fl. Ind. 62. t. 23; Fl. Br. I. 3, 513; Dalz. & Gibs. Bomb. Fl. 137; Brandis For. Fl. 284; Cooke Fl. Pres. Bomb. 2, 84; Gamble

Ind. Timb. 440; *E. glandulifera,* Dalz. & Gibs. Bomb. Fl. 137. *Waiwarung, karkannie,* Vern. *Varading,* Guz.

A large shrub climbing by means of long, slender, flexible, deciduous branches, the bases of which remain as deflexed spines; bark smooth, shining, covered with large lenticels and conical emergences. Leaves lanceolate or oblong-lanceolate, 1·5″-3″ by ·5″-1·25″, shortly obtusely acuminate at the apex, acute or rounded at the base, thinly coriaceous, glabrous and shining on both sides, pale beneath and covered with small, sunken, reddish glands; lateral-nerves inconspicuous; midrib prominent, often with large, axillary, closed or open glands; petioles ·25″-·5″ long, usually bordered with large glands. Flowers minute, 5-merous, in copious-flowered, panicled, lax racemes; inflorescence terminal, pubescent, 6″-2′ long; bracts very small, setaceous, deciduous. Calyx-lobes acute, broad, ciliate. Petals greenish-yellow, free or nearly so, recurved, puberulous on both sides. Stamens shorter than the petals, erect. Berry nearly globose, ·2″ in diameter, smooth, crimson, tipped with the style.

Throughout India from the Central Himalayas to Ceylon, alt. 0-5000′, Konkan and North Kanara; rare in the latter district but fairly common in rain-forest near the Gairsoppah ghât. Fl. C. S. Fr. May. Seeds used in native medicine as an anthelmintic, also to adulterate black pepper.

2. E. robusta, Roxb. Fl. Ind. 1, 587; Fl. Br. I. 3, 515; Bedd. Fl. Sylv. 137; Brandis For. Fl. 284; Cooke Fl. Pres. Bomb. 2, 85; Gamble Ind. Timb. 440; *E. Basaal,* Dalz. & Gibs. Bomb. Fl. 136. *Kokla, carbati, ambati, waiwarung,* M.; *Byebering,* Vern.; *Wayuwalingi-balli,* Kon.; *Vaivaling, amti, jolad-hanna,* K.

A large, rambling or scandent, glabrous shrub; branches glabrous; young parts sometimes rusty-tomentose. Leaves ovate or broadly elliptic, 2″-4″ by 1·2″-2·2″, shortly acuminate, or subobtuse at the apex, acute or rounded at the base, membranous, puberulous or glabrescent beneath; margins entire, somewhat undulate; lateral-nerves 6-7 pairs; venation conspicuous, purple beneath; petioles ·25″ long, channelled, not marginate. Flowers dicœcious, 5-merous, greenish-yellow, honey-scented, shortly pedicelled, in small, axillary and terminal racemes, shorter than the leaves; pedicels ·12″ long; bracts subulate, very small. Calyx-lobes subacute, gland-dotted, puberulous. Corolla divided to the base into 5 reflexed petals, puberulous on both sides. Berry globose, red, about ·2″ in diameter, longitudinally ribbed, apiculate; pulp scanty.

Throughout India from the Himalayas to Ceylon and Tenasserim; common in the monsoon-forests of the Konkan and North Kanara. Fl. Fr. Apl.-June.

A large climbing, scandent or erect shrub. Stems as much as 1′ in diameter at the base, usually much branched. Bark grey, smooth with irregular cup-like depressions from fallen scales; inner-bark thick, dark-purple, fibrous, lighter

coloured in the smaller stems. Wood soft, reddish. Medullary rays very broad, brown-dotted, extending into the bark. Pores moderate-sized, crowded in the spring wood, or small and few in the rest of the annual-ring. Pith large, containing long resin-canals. Weighs 45 lbs. to the cub. ft. Fruit small, red, sweet, edible. Bark and fruits used in native medicine.

3. E. viridiflora, Scheff. Myrs. Arch. Ind. 45; Fl. Br. I. 3, 516; Cooke Fl. Pres. Bomb. 2, 85; Gamble Ind. Timb. 440; *Samara viridiflora,* Thw. Enum. 173; Bedd. Fl. Sylv. t. 138; *E. Basaal,* Mez. in Engl. Pflanzenreich, 4, 327. *Ambat,* M.

A large, quite glabrous climbing shrub with lenticellate, warted branches. Leaves ovate-oblong or elliptic, 3″-5″ by 1·5″-2·5″, acute, obtuse or acuminate at the apex, tapering at the base, coriaceous, glabrous, punctate on both sides with opaque dots; margins often narrowly recurved; lateral-nerves and venation conspicuous beneath; petioles ·5″-1″ long. Flowers small, yellowish-purple, 4-merous, in short, cylindrical racemes from the axils of the fallen leaves; pedicels ·1″ long; bracts ovate, ·05″ long, often with 2 lateral, obscure teeth. Calyx 4-toothed, gland-dotted; teeth nearly distinct. Petals free, oblong, obtuse, ·08″ long, twice as long as the calyx, gland-dotted on both sides. Stamens long-exserted in the male flower; anthers not apiculate. Fruit globose, ·25″-·4″ in diameter, smooth, crimson, tipped with the stout, persistent style.

Hills of Southern India, Nilgiris, Pulneys, etc. 2-5000′; Ceylon 4-6000′, Western peninsula on the higher ghâts; common in the Mahableshwar jungles on laterite. Fl. Dec.-Jan. Stems 4″-6″ in diameter at the base. Bark dark-brown, shining, covered with white, raised, corky lenticels; inner-bark blood-red, juicy. Wood reddish-white, porous. Pores large, resinous. Medullary rays broad, few.

4. ARDISIA, Swartz.

Shrubs or small trees. Leaves coriaceous. Flowers small, hermaphrodite, in compound or simple, terminal and axillary umbels or racemes; bracts small, deciduous. Calyx 4-5-lobed; lobes contorted or imbricate, sometimes enlarged in fruit. Corolla rotate, red, white or spotted, deeply 4-5-lobed; lobes twisted to the right. Stamens 4-5, attached to the base of the corolla; filaments very short, anthers free. Ovary free, ovoid or subglobose; style cylindric; stigma minute or punctiform; ovules few. Fruit globose. Seed solitary, globose; albumen usually white, horny, pitted or ruminate; embryo cylindric, transverse.

Leaves opaque, entire. Flowers in peduncled corymbs.
Corolla pink with black dots. Fruit black ... 1. A. humilis.

Leaves gland-dotted, crenate. Flowers in simple umbels. Corolla white. Fruit red .... 2. A. parviflora.

1. A. humilis, Vahl. Symb. 3, 40; Fl. Br. I. 3, 529; Dalz. & Gibs. Bomb. Fl. 137; Brandis For. Fl. 287; Gamble Ind. Timb. 441; *A. solanacea,* Roxb. Cor. Pl. t. 27; Cooke Fl. Pres. Bomb. 2, 86; Mez. in Engl. Pflanzenreich 4, 132 and 128; *A. elliptica,* Bedd. Fl. Syl. 138; *Dikna,* Vern.; *Chitmitlmune-gidda, halad, havalad,* K.

Fig 368. Ardisia humilis, Vahl.

A large shrub or small tree; branches cylindrical, numerous, marked with the scars of fallen leaves. Leaves alternate, ovate-oblong, 4″-8″ by 2″-4″, subcoriaceous, glabrous, entire, obtuse or subacute at the apex; blade attenuate and decurrent along the petiole at the base; petioles ·25″-·5″ long, stout, channelled. Flowers in pedunculate, axillary corymbs shorter than the leaves; pedicels ·5″-1″ long. Sepals connate at the base; puberulous, densely gland-dotted and ciliate on the margins. Corolla-lobes thick, rose-coloured, acute, ·4″ long, densely black-dotted and marked with dark-coloured, longitudinal lines. Stamens shorter than the corolla-lobes; anthers large, lanceolate-acute, connivent round the exserted style. Ovary ovoid, glabrous. Fruit globose, apiculate, somewhat depressed, ·25″-·4″ in diameter, purple-black, seated on the enlarged calyx-lobes.

Tropical India from the Himalayas to Ceylon; in monsoon and rain-forest throughout the Konkan and North Kanara, usually along the banks of nalas and streams, common. Fl. Apl.-May. Fr. ripe Aug.

A large much branched shrub or small tree, 4″-6″ in diameter at the base and 30′ high. Bark grey, thin, corky; underneath the green-cell layer is a white

cellular tissue with glands filled with a red resin; inner-bark alternate thin layers of lighter and darker brown tissue. Wood reddish-grey, moderately hard. Pores very small, equally distributed. Medullary rays broad or moderately broad, wavy. Weighs about 55 lbs. to the cub. ft.

2. A. parviflora, Talb. Trees, Bomb. 204; Cooke Fl. Pres. Bomb. 2, 87; Brandis Ind. Trees, 418.

A small, erect, branched glabrous shrub. Leaves obovate, 3″-4·5″ by 1″-1·75″; acute, base cuneate, distantly crenate, pellucid-punctate, coriaceous; petioles ·25″ long. Flowers ·3″-·5″ across, in simple, peduncled, axillary or terminal umbels, about half the length of the leaves. Corolla small, white, neither pink nor spotted. Fruit red, size of a pea, globose, not striate.

In the evergreen bush-wood near the coast in the Karwar subdivision of North Kanara. Fl. R. S. Fr. C. S

5. ÆGICERAS, GÆRTN.

A shrub or small littoral tree; branches cylindric. Leaves alternate, obovate, coriaceous, 1-nerved. Flowers white, hermaphrodite, in terminal, leaf-opposed or axillary, sessile umbels; bracts O. Calyx-lobes 5, obliquely imbricate. Corolla-lobes 5, acute, twisted to the right in bud. Stamens 5; filaments linear, hairy at the base; anthers many-celled with transverse septa. Ovary oblong, narrowed into a filiform style; stigma small; ovules many, immersed in a central, globose placenta. Fruit cylindric, falcately curved, 1-seeded, dehiscent. Seed conform with the fruit, exalbuminous, germinating within the pericarp; radicle inferior, long, enlarged at the base; cotyledons very short.

Æ. majus, Gærtn. Fruct. 1, 216. t. 46. fig. 1; Fl. Br. I. 3, 533; Dalz. & Gibs. Bomb. Fl. 137; Bedd. Fl. Sylv. 139; Cooke Fl. Pres. Bomb. 2, 88; Gamble Ind. Timb. 442. *Kanjala,* M.; *chawir,* Sind.

A large glabrous, evergreen, gregarious, littoral shrub or small tree. Leaves obovate-obtuse, narrowed into the petiole at the base, 2″-3″ by 1·25″-1·6″, coriaceous, glabrous on both sides, pale-green, shining above, somewhat glaucous beneath; midrib prominent; lateral-nerves slender; petioles ·25″ long. Flowers moderate-sized, white, fragrant, in simple, terminal or leaf-opposed umbels. Calyx-lobes twisted in bud, membranous on the margins. Corolla thick, white, ·5″ long; tube short, woolly within; lobes triangular, very acute, reflexed. Fruit curved, cylindric, 1″-2·5″ long, cinnamon-brown, acuminate at the apex, surrounded at the base with the enlarged, persistent calyx.

Sea coasts and tidal creeks of India from Sind to Singapore; gregarious and very common near the coasts of Kanara and the Konkan on salt marshy ground and along creeks. Fl. C. S. Fr. R. S.

Bark grey. Wood reddish-brown, sometimes with yellowish streaks, moderately-hard and close-grained. No annual-rings. Pores small, uniformly distributed. Medullary rays short, scanty, broad and moderately broad. Weighs about 40 lbs. to the cub. ft. One of the best woods in the Mangrove formation. This plant considered a true Mangrove was named *Rhizophora corniculata* by Linnæus.

Fig 369. Ægiceras majus, Gærtn.

Order LV.—SAPOTACEÆ.

Trees or sometimes shrubs. Leaves alternate, coriaceous, simple; stipules O. Flowers axillary, bisexual, solitary or clustered; bracts and bracteoles small or O. Calyx-lobes persistent, 4-8, 1-2-seriate; the outer series valvate; when 4, decussate, imbricate; when 5, 2-3 exterior imbricate. Corolla-tube short; lobes as many or twice as many as calyx-segments, imbricate in bud. Stamens on the corolla-tube as many as the corolla-lobes and opposite to them or 2-3-times as many, 1-3-seriate; filaments usually shorter than the anthers; connective often produced; staminodes when present, alternating with the stamens. Ovary superior, 2-8-celled; style linear; stigma punctiform; cells 1-ovuled; ovules usually attached to the inner angles of the cells. Fruit a drupe or berry, usually indehiscent, 1-8-seeded. Seeds ellipsoid; testa bony or crustaceous; albumen fleshy, or oily, or O.

Calyx-lobes 1-seriate, imbricate. Stamens 5-6.
- Lateral-nerves close-set, prominent. Staminodes O. ... ... 1. Chrysophyllum.
- Lateral-nerves not close-set. Staminodes 5 ... 2. Sideroxylon.

Calyx-lobes 2-seriate; outer valvate. Stamens 6-numerous.
- Calyx-lobes 4.
  - Stamens 8 ... ... 3. Isonandra.
  - Stamens 16-20 ... ... 4. Bassia.
- Calyx-lobes 6-8.
  - Corolla-lobes 6. Stamens 12-18 ... ... 5. Palaquium.
  - Corolla-lobes 18-24. Stamens 6-8 ... ... 6. Mimusops.

A small Natural Order containing besides a number of other useful and valuable fruit and timber trees the well known indigenous *Mohwa (Bassia latifolia)* of which the flowers and fruit are very important commercial and economic products.

1. CHRYSOPHYLLUM, LINN.

Trees. Leaves alternate, coriaceous, exstipulate. Flowers small, pedicellate or subsessile in axillary fascicles. Calyx-lobes 5-6, entire, imbricate. Corolla-lobes 5-6, entire, imbricate. Stamens 5-6; staminodes O. Ovary 5-6-

celled, villous; style cylindric. Berry fleshy, globose. Seeds 5-6 compressed, with a hard testa; hilum elongate; albumen copious or scanty.

C. Roxburghii, G. Don. Gen. Syst. IV, 33; Fl. Br. I. 3, 535; Dalz. & Gibs. Bomb. Fl. 139; Bedd. Fl. Sylv. t. 236; Cooke Fl. Pres. Bomb. 2, 89; Gamble Ind. Timb. 443. *Hale, bokly,* K.; *Tursiphul, dongrima-phul,* Vern. *The Star Apple.*

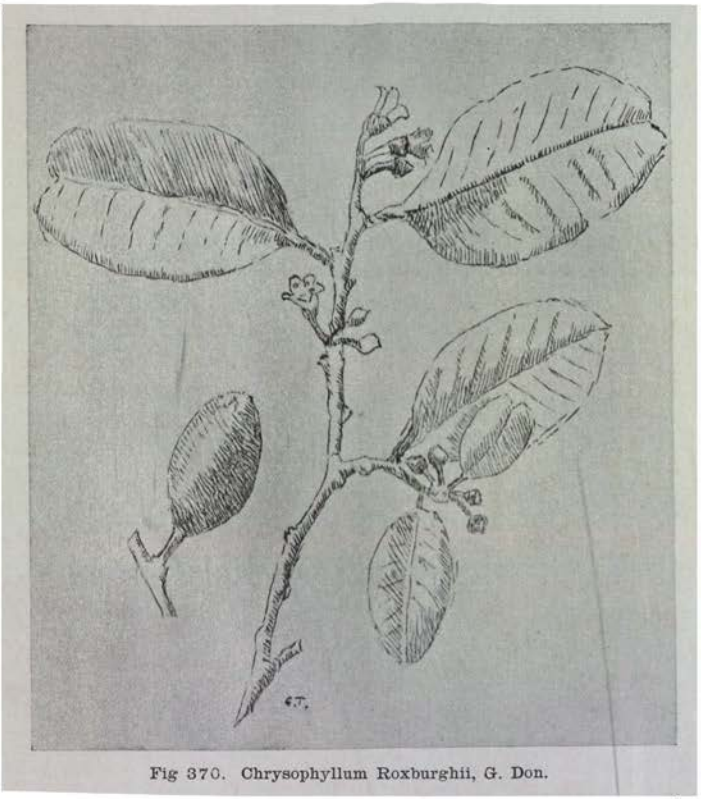

Fig 370. Chrysophyllum Roxburghii, G. Don.

A large or medium-sized evergreen tree; branchlets terete, rusty-tomentose. Leaves coriaceous, ovate, abruptly and obtusely acuminate, 3·5″-5·5″ by 1″-2″, dark-green, glabrous, shining above, paler beneath; midrib more or less rusty-tomentose beneath; lateral-nerves parallel, numerous, slender, prominent and looping within the margins; petioles rusty-pubescent, ·25″-·5″ long. Flowers small, ·2″ in diameter, in axillary, many-flowered, rounded, tomentose fascicles; pedicels ·2″ long. Calyx-lobes imbricate, obtuse. Corolla-tube campanulate; lobes short, ciliate. Stamens included. Fruit depressed-globose, 1″-2″ in diame-

ter, 5-6-ridged, greenish-yellow and glabrous when ripe; seeds 5-6, compressed, with a pale-brown, hard, shining testa.

Bengal, Burmah, Pegu, Assam, Sylhet and the Khasia Hills, Western ghàts and Ceylon; common in the rain-forests of the Konkan and North Kanara. Fl. Apl.-May. Fr. Nov.-Dec. Wood white, close-grained, moderately hard. Pores small, in radial, oblique or straight lines or strings. Medullary rays very fine and indistinct. Cross-bars of white tissue oblique, distinct. Weighs about 40 lbs. to the cub. ft. Used for building purposes. Fruit edible.

2. SIDEROXYLON, Linn.

Trees. Leaves coriaceous, alternate, exstipulate. Flowers small, in axillary fascicles, shortly pedicelled; pedicels pubescent or tomentose. Calyx-segments 5, much imbricate, subequal. Corolla-tube campanulate; lobes 5, imbricate. Stamens 5 at the base of the corolla-lobes and opposite to them; staminodes 5, lanceolate. Ovary villous, usually 5-celled; style short or long, cylindric. Berry ovoid or globose, 1-5-seeded. Seeds albuminous; testa hard; cotyledons flat, broad; radicle short.

Fig 371. Sideroxylon tomentosum, Roxb.

S. tomentosum, Roxb. Fl. Ind. 1, 602; Fl. Br. I. 3, 538; Cooke Fl. Pres. Bomb. 2, 90; Gamble Ind. Timb. 444; *Sapota tomentosa,* Dalz. & Gibs. Bomb. Fl. 139; *Achras elengoides,* Bedd. Fl. Sylv. t. 235. *Kumpoli, gomale, gwabale, suma-hale,* K.; *Kumbul, kanta-kumla,* Vern.

A small, moderate-sized or large spinous tree; branchlets and young parts rusty-tomentose. Leaves obovate, acute at the apex, cuneate at the base, 2″-3″ by 1″-2″, thinly-coriaceous, tomentose, at length glabrous shining above, white or tawny-tomentose beneath; lateral-nerves 10-12 pairs; petioles ·25″-·5″ long,

tomentose. Flowers small, in axillary, rounded fascicles; pedicels drooping, ·25″-·5″ long, rusty-pubescent. Calyx ·25″ long; lobes lanceolate, imbricate, densely tomentose. Corolla white, about ·25″ long; lobes 5, lanceolate, acute. Ovary densely hairy; style long-exserted, glabrous. Fruit ovoid, ·75″-1″ long, tomentose, yellow when ripe; seed usually solitary, smooth, polished, shining.

Western peninsula from the Konkan to Ceylon, Burmah; common in the Nilgiris up to 6-7000′ and in monsoon and rain-forests of the North Kanara and Konkan ghâts. Fl. C. S. Fr. Oct.-Jany.

A small, moderate-sized or large, spinous tree often with a fluted stem. Bark thin, reddish-brown, rough and much cracked. Wood reddish-grey, moderately-hard, smooth, close-grained. Annual-rings sometimes distinct. Pores very small, in short lines between the very fine and close medullary rays which are also joined by minute transverse bars of white tissue. Weighs about 58 lbs. to the cub. ft. Used in the Madras Presidency for house-construction etc. Fruit is eaten in curries and made into pickles. A very variable species of which there are two well marked varieties, one with very tomentose foliage found in the Deccan and Konkan and the other more glabrous form common on the Nilgiris and other South Indian hills above 5000′.

3. ISONANDRA, WIGHT.

Trees with milky juice. Leaves alternate, coriaceous, glabrous. Flowers villous, in axillary clusters, shortly pedicelled. Calyx-segments 4, subequal, imbricated. Corolla deeply 4-lobed, longer than calyx, Stamens 8, all perfect; staminodes 0. Ovary villous, 4-celled; style linear. Berry 1-seeded, flattened, smooth; albumen fleshy.

1. Candolliana, Wight. Ic. t. 1220; Dalz. & Gibs. Bomb. Fl. 139; Cooke Fl. Pres. Bomb. 2, 91; Gamble Ind. Timb. 444; *I. lanceolata,* Wight. Ic. t. 359; Brandis Ind. Trees, 424.

A small or medium-sized tree with red-tomentose branchlets. Leaves very variable, from lanceolate to obovate-oblong, 2″-6″ by 1″-2·5″, bluntly-acuminate, glabrous on both sides; lateral-nerves 6-10 pairs, prominent beneath; petioles ·25″ long. Flowers small, in sessile, rounded, axillary clusters, bracteate at the base. Calyx deeply 4-divided; lobes 4, broadly ovate, very unequal; exterior larger and hairy, ciliate. Corolla 4-partite; lobes emarginate. Ovary hairy; style exserted. Fruit a 1-seeded, ellipsoid berry, ·75″ by ·25″.

"A tree on the ghâts not uncommon." Dalz. Common on the Nilgiris about Ootacamund where it flowers during the hot season. I have not met with this species in North Kanara nor has it been seen by collectors subsequent to Dalzell as far as I know.

I. Stocksii, Clarke; Fl. Br. I. 3, 539; Cooke Fl. Pres. Bomb. 2, 91. Cooke remarks in his Fl. Pres. Bomb. that there are 2 specimens of this species in Herb. Kew. with tickets printed "Hab. Malabar, Concan etc. Coll. Stocks, Law etc." but unsigned by any collector. It is probably not indigenous within the Bombay presidency limits.

4. BASSIA, LINN.

Trees with milky juice. Leaves petioled, coriaceous; stipules caducous. Flowers on axillary, generally fasciculate, usually drooping pedicels, crowded near the ends of the branches with the leaves. Calyx deeply 4-lobed; lobes imbricate biseriate, the outer enclosing the 2 inner. Corolla-tube fleshy or not, often caducous; limb of 5-14 divisions. Stamens numerous, fertile, in 1-series; filaments usually short; anthers erect, cordate, cuspidate or aristate, 2-celled; staminodes O. Ovary usually villous, 4-12-celled; style subulate, long-exserted. Berry globose or ellipsoid, 1-3-seeded; albumen O; cotyledons oblong, fleshy, oily; radicle short, inferior.

Anthers 20-30, 3-seriate ... ... 1. B. latifolia.

Anthers 16-20, 2-seriate.

Ovary and young fruit densely hirsute ... ... 2. B. longifolia.

Ovary and young fruit glabrous ... ... 3. B. malabarica.

1. B. latifolia, Roxb. Fl. Ind. 2, 526; Fl. Br. I. 3, 544; Brandis For. Fl. 289; Bedd. Fl. Sylv. t. 41; Dalz. & Gibs. Bomb. Fl. 139; Cooke Fl. Pres. Bomb. 2, 92; Gamble Ind. Timb. 447. *The Butter or Mahua Tree. Mahwa, mhowra, mohwa, mowha,* M.; *Pokka, oodlu, ippi, hal-tumbri,* K.

A large tree with a short trunk and a rounded crown; young parts densely rufous-tomentose. Leaves elliptic, 10″-6″ by 5″-3·5″, bluntly-acuminate at the apex and usually acute at the base, coriaceous, sparsely hairy when young, glabrous when old; lateral-nerves about 12 pairs, parallel and prominent beneath; stipules subulate, caducous; petioles 1′-1·5″ long. Flowers in dense fascicles at or near the ends of the branches; buds ·75″ long, ovoid, long-pointed and densely rufous-tomentose; pedicels thick, about 1″ long, tomentose. Calyx usually 4-divided nearly to the base; the 2 outer lobes subvalvate and enclosing the 2 inner. Corolla about ·5″ long; tube caducous, ·3″ long, thick, fleshy, yellow; lobes usually 7-9, erect, ovate-lanceolate. Stamens inserted on the tube of the corolla, 24-26 in 3 rows; anthers hairy at the back. Ovary red-tomentose; style long-exserted, hairy at the base. Fruit ovoid, fleshy, 1″-2″ in diameter, greenish, 1-4-seeded.

Forests of Central India 1-4000′; from Western Bengal to the Western ghâts and Kumaon Terai; common in deciduous forests throughout the presidency

also in the Konkan and North Kanara but comparatively rare in the latter district, often cultivated and self-sown near villages; prefers dry sandy and rocky soils and thrives on the Deccan trap. Fl. Mch.-Apl. Fr. June-July.

A large light-demanding tree, scattered in open forest throughout the area of distribution but nowhere gregarious. Bark thick, dark-coloured, fissured and cracked, scaly; inner-bark red, milky. Wood reddish-brown, moderately-hard or hard. Annual-rings indistinct. Pores moderate-sized, in short radial lines more or less in echelon. Medullary rays fine, numerous and joined by very fine bars of white tissue. Weighs about 66 lbs. to the cub. ft.

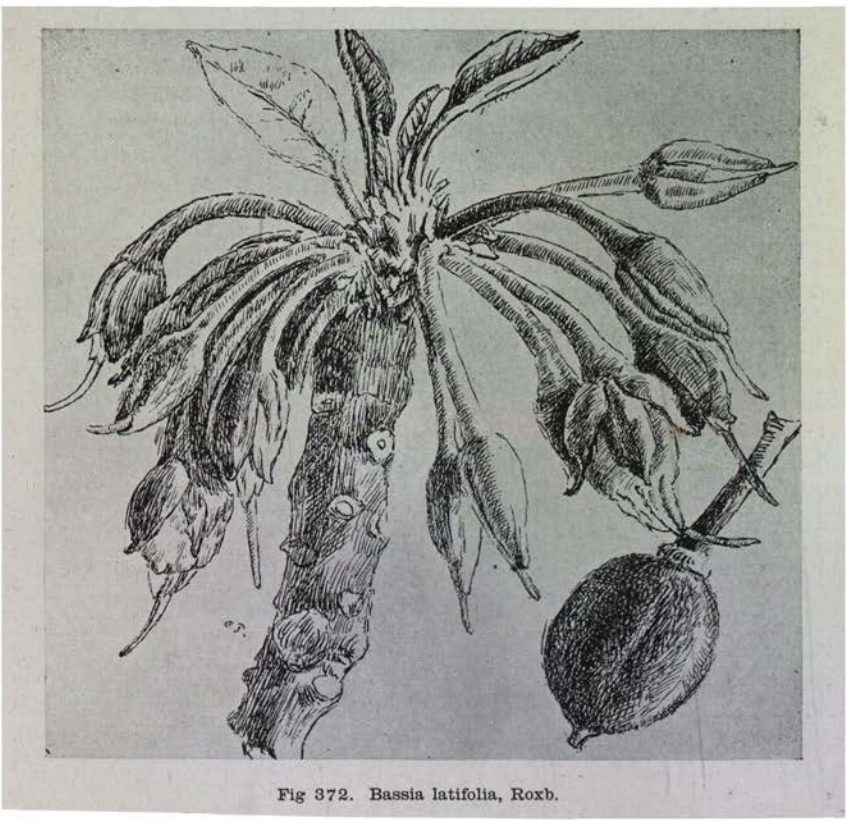

Fig 372. Bassia latifolia, Roxb.

Yields timber of excellent quality which is but little in demand as on account of the great value of the flowers and fruit trees are seldom felled. The seasoned timber is however used when available for native furniture, house-building, naves of wheels etc. The most important product of the *Mowha* is the fleshy cream-

coloured, caducous corollas which either raw or cooked are largely eaten by the Bhils and other wild tribes in the Khandesh, Tannah and Nasik districts and generally throughout Central India. When properly prepared they are a wholesome and pleasant article of diet. *Mowha* flowers are also used in the distillation of country liquor and are collected by the wild tribes in large quantities and sold to Government Abkari Contractors in several of the Deccan districts. The clearing of the ground underneath the trees during the flowering season is unfortunately a frequent cause of forest fires. The flowers are greedily devoured by bears and other wild animals. The fruit also yields several valuable products. The outer part of the pericarp is eaten by the wild tribes either raw or cooked as a vegetable. The inner part when dried is ground into a coarse flour or meal used for making cakes. The seeds *(Mothi)* contain much edible greenish-yellow oil which solidifies on exposure into the so called "*Mowha*" butter used in cooking and sometimes to adulterate ghee. The dried seeds *(Tolambi)* are collected by the Forest Department in Nasik and Khandesh and are exported to Europe from Bombay for the manufacture of margarine and soap. The trade in this produce is increasing. During the famine in the Panch Mahals in 1899 *Mohwa* leaves were used as cattle fodder.

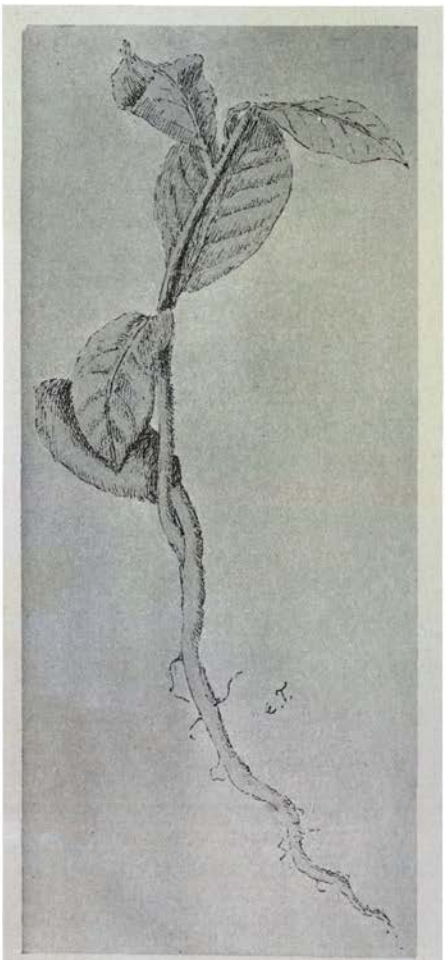

Fig 373. Bassia latifolia, Roxb.—*Seedling.*

2. B. longifolia, Linn. Mant. 563; Fl. Br. I. 3, 544; Dalz. & Gibs. Bomb. Fl. 139; Bedd. Fl. Sylv. t. 42; Brandis For. Fl. 290; Cooke Fl. Pres. Bomb. 2, 92; Gamble Ind. Timb. 448. *The Mohwa Tree of South India. Ippi, movaro,* K.; *Mohwa,* M.

A large or medium-sized evergreen tree; young parts rusty-tomentose. Leaves lanceolate, clustered at the ends of the branches, 2″-4″ by ·6″-1″,

acute at the apex and base, thinly coriaceous, dark-green, shining above, paler beneath, glabrous when old; lateral-nerves about 10 pairs, prominent beneath; petioles slender, ·5″-·75″ long; stipules subulate, rufous-hairy, caducous. Flowers fascicled, in dense clusters at the ends of the branches along with the leaves; peduncles drooping, 1·5″-2″ long. Calyx-lobes 4, ovate-acuminate, ·5″ long, densely red-tomentose. Corolla ·5″ long; tube fleshy, inflated, glabrous; lobes 8-12, lanceolate-obtuse, slightly exceeding the tube. Stamens 16-20 in 2 rows; anthers sessile or in lower row with very short filaments, hairy, cordate at the base; 3-toothed at the apex; connective pointed. Ovary 8-celled, rufous-hairy; style long-exserted. Fruit obliquely ovoid, 2″ long, tomentose when young, glabrous, yellow when ripe, 1-2-seeded; seeds curved, yellow, shining, compressed.

Western peninsula on the ghàts from Konkan southwards to Ceylon, often planted in Ceylon; common in the monsoon-forests of the Konkan and North Kanara; often found along the banks of rivers and nalas; takes the place of *B. latifolia,* in the moist forests of the southern parts of the presidency. Fl. Nov.-Dec. Fr. ripe May-June.

A large evergreen tree. Bark dark-brown, scaly; inner-bark red, milky. Sapwood brownish-grey; heartwood hard, brownish-red, close-grained. Pores in short, often oblique echeloned lines or strings, sometimes filled with a white substance probabably gum or resin. Medullary rays fine, uniform, crossed by rather faint, fine, transverse, irregular bars of white tissue. Weighs about 65 lbs. to the cub. ft. The flowers are edible and spirit is distilled from them. The fruit yields an oil used for cooking and for soap-making also as an application in cutaneous diseases. The heavy, hard, red-coloured wood is employed by boat-builders for keels and planking in Southern India and for the construction of carts and bridges. A gum exudes from wounds in the bark sometimes used in native medicine. In the Fl. of Ceylon Trimen describes this tree as very large, 6′ in diameter, deciduous for a few days in the dry season and quickly covered with yellowish-pink young leaves. Used for carts, furniture and boat building. A useful timber.

3. B. malabarica, Bedd. Fl. Sylv. 140; Fl. Br. I. 3, 544; Cooke Fl. Pres. Bomb. 2, 92; Gamble Ind. Timb. 448. *Udlu,* K.

A moderate-sized or large tree. Leaves ovate-lanceolate, 3·5″-7·5″ by 1″-2″, crowded at the ends of the branches, coriaceous, glabrous; lateral-nerves about 16 pairs; petioles ·5″ long. Flowers in axillary fascicles near the ends of the branches, usually 5-6 together; buds ovoid, more or less silky-pubescent; pedicels ·25″-·5″ long, increasing in length up to 1·5″. Calyx-lobes 4, divided nearly to the base, ·4″ long, the 2 outer glabrous, the 2 inner silky on the outside. Corolla ·5″ long; tube rufous-hairy; lobes 6, oblong-obtuse, hairy, longer than the tube. Stamens 16-22 in 2 rows; anthers cordate at the base; filaments very short,

rufous-hairy; connective excurrent. Ovary glabrous; style long exserted. Fruit obovoid, about 1″ long, green, glabrous.

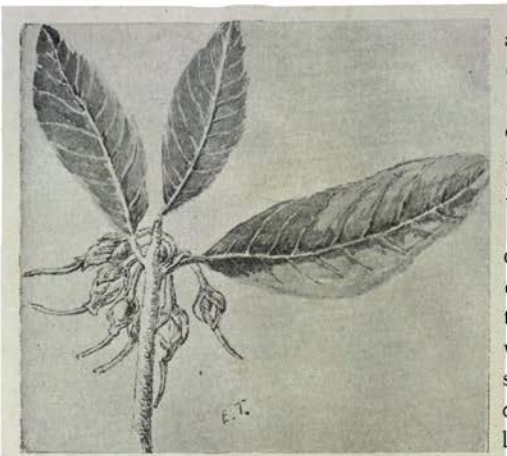

Fig 374. Bassia malabarica, Bedd.

Western peninsula, Malabar and the Anamallais up to 4000′; common in the southern parts of North Kanara along the banks of rivers and in rain-forest up to 2000′. Fl. Nov.-Dec. Fr. ripe May-June.

A moderate-sized tree. Bark dark-coloured, scaly. Wood red-coloured, moderately hard, sometimes with irregular masses of white, soft tissue. Pores fine, single or in short, straight or oblique lines or strings. Medullary rays white, numerous, fine, crossed by close, fine, equidistant lines of white tissue; weighs 42 lbs. to the cub. ft. The timber is liable to the attacks of borers and is not as strong as that of *Bassia longifolia*; it is scarely used in N. Kanara.

5. PALAQUIUM, Blanco.

Trees with milky juice; shoots rusty-tomentose. Leaves petioled, coriaceous. Flowers pedicellate, fascicled, axillary. Calyx-lobes 6, 2-seriate; outer 3 valvate; inner 3 imbricate. Corolla-lobes 6 in 2 series. Stamens 12-18, 1-seriate or the alternate a little higher up; anthers lanceolate; connective produced, acute or bifid; staminodes O; ovary villous, usually 6-celled. Berry 1-2-seeded. Seed exalbuminous; cotyledons thick, fleshy.

P. ellipticum, Engl. in Engl. & Prantl. Pflanzenf. 4, 135; Cooke Fl. Pres. Bomb. 2, 94; *Dichopsis elliptica,* Benth. in Gen. Plant. II, 658; Fl. Br. I, 3, 542; Gamble Ind. Timb. 446; *Bassia elliptica,* Dalz. & Gibs. Bomb. Fl. 139; Bedd. Fl. Sylv. t. 43. *Indian Gutta-percha Tree; Panchonta,* K.

A large tree with a long, straight, cylindrical trunk, unbranched to near the top. Leaves elliptic-oblong, 3″-4″ by 1·5″-2″, abruptly-acuminate, narrowed into the petiole at the base, coriaceous, dark-green above, paler beneath; lateral-nerves about 10 pairs strong on the underside; petioles ·5″-1″ long. Flowers 1-3, axillary, peduncled; peduncles longer than the petiole, erect in fruit. Calyx 6-divided nearly to the base; lobes broadly ovate, ·3″ long in 2 series, the outer 3

larger than the 3 inner. Corolla dark-red, ·5″ long, caducous; lobes 5-6, contorted in bud, silky outside; tube shorter than the lobes, hairy within. Stamens 12-18, 1-seriate, inserted on the inside of the corolla-tube; filaments very short, unequal; connective produced, bifid at the apex. Ovary tomentose, 6-celled; cells 1-ovuled; style long-exserted. Fruit oblong, 1-seeded, about 1″ long; seed erect with a crustaceous, shining, pale-brown testa; cotyledons fleshy.

Western ghàts from Bombay southwards, ascending to 4000′; common in the Wynaad, Coorg and Travancore; very rare in the Bombay presidency, in rain-forest near Castle-Rock, N. Kanara. A large evergreen tree. Wood reddish-brown, hard and durable. Pores moderate-sized, in oblique strings or lines. Medullary rays fine, numerous, crossed by numerous, concentric lines of light-coloured, wavy tissue. Yields an inferior kind of "Guttapercha" which is utilized for waterproofing and cement, obtained by tapping the living trees. This product is not collected in S. India.

6. MIMUSOPS, Linn.

Trees with milky juice. Leaves coriaceous; nerves slender, numerous, parallel. Flowers axillary, clustered or solitary. Calyx-segments 6-10 in 2 series, outer valvate in bud. Corolla-tube short; lobes 18-24, 2-3-seriate. Stamens 6-8; anthers lanceolate; connective excurrent; staminodes as many as the stamens, subpetaloid, bifid or lacerate. Ovary hirsute, 6-8-celled. Fruit a globose, fleshy berry. Seeds usually solitary, compressed, with a hard, shining testa, albuminous; cotyledons large, flat.

Calyx-lobes and stamens 8; staminodes lanceolate, hairy ... ... 1. M. Elengi.

Calyx-lobes and stamens 6; staminodes bifid at the apex, glabrous ... ... 2. M. hexandra.

1. M. Elengi, Linn.; Roxb. Fl. Ind. 2, 236; Fl. Br. I. 3, 548; Dalz. and Gibs. Bomb. Fl. 140; Bedd. Fl. Sylv. t. 40; Brandis For. Fl. 293; Cooke Fl. Pres. Bomb. 2, 95; Gamble Ind. Timb. 449. *Buckhul, ranjal,* K.; *Borsali,* Guz.; *Owli, wovali,* M.

A large evergreen tree with a long cylindrical trunk; young parts silky-pubescent. Leaves scattered, broadly ovate, 3·5″-5″ by 1·5″-2·5″, shortly acuminate, subacute at the base, coriaceous, glabrous, dark-green shining above, paler beneath; margins undulate; lateral-nerves numerous and very slender; stipules minute; early caducous; petioles ·5″-1″ long, slender. Flowers white, sweet-scented, ·75″ across, axillary, solitary or 2-6-fascicled; pedicels ·5″-·75″ long, tomentose, often deflexed. Calyx divided nearly to the base into 6 lanceolate,

subacute, tomentose lobes. Corolla-tube very short, fleshy; lobes linear-oblong, ·3″ long, 24 in 2 series, the inner of 8 and the outer of 16 lobes. Stamens 8, opposite the inner corolla-lobes; anthers nearly sessile, long-acuminate; cells divergent at the base; staminodes 8, alternate with the stamens, short, hairy at the back. Ovary adpressed silky-pubescent; style slightly longer than the corolla. Fruit ovoid, yellow, 1″ long; seed solitary, compressed, light-brown, shining.

Fig 375. Mimusops Elengi, Linn.

Western peninsula on the ghâts from Bombay southwards to Ceylon, Burmah and the Malay peninsula, often cultivated; common in the rain-forests of North Kanara and the Konkan. Fl. Jan.-Mch. Fr. ripe C. and R. S.

A large or very large evergreen tree. Bark smooth, scaly. Heartwood red, hard, even-grained. Pores small, in short, radial or oblique lines. Medullary rays fine, crossed by broader and more widely separated wavy lines of lighter coloured tissue. Weighs about 62 lbs. to the cub. ft. Takes a good polish. Used for house building, cabinet work, etc. The sweet-smelling, star-like flowers which retain their odour even when dry are made into necklaces; a scent is also extracted from them. The fruit is edible and the oil from the seeds is employed for cooking, burning and in medicine. The bark is much used in native medicine.

2. **M. hexandra,** Roxb. Fl. Ind. 2, 238; Fl. Br. I. 3, 549; Dalz. & Gibs. Bomb. Fl. 140; Bedd. Fl. Sylv. 142; Cooke Fl. Pres. Bomb. 2, 95; Gamble Ind. Timb. 450; *M. indica*, Brandis For. Fl. 291. *Khirni*, H.; *Ranjana, raini,* M.

A large or very large tree, sometimes only a shrub. Leaves scattered, broadly obovate, 2·5″-4·25″ by 1·5″-1·75″, obtuse or emarginate at the apex, subacute at the base, subcoriaceous, dark-green above, paler beneath; midrib prominent beneath, impressed above; lateral-nerves 12-20 pairs, fine, parallel, not prominent; petioles ·5″ long, channelled above. Flowers pale-yellow, small, numerous, axillary, fascicled on slender, curved peduncles ·25″ long. Calyx-lobes 6, lanceolate, subacute, ·25″ long, pubescent outside, reflexed; the 3 outer ciliate and broader than the 3 inner. Corolla-tube very short; lobes 18, the 6 inner longer than the rest and shortly clawed, the 12 outer linear-acute. Stamens 6; filaments as long as the acute anthers; staminodes 6, alternate with the anthers, laciniate at the top. Ovary silky-pubescent, 12-celled; style long-exserted. Fruit small, about ·6″ long, ovoid, shape of an olive, smooth, red; seed solitary, reddish-brown, shining.

Deccan peninsula and Southern India; dry regions of Ceylon; in the dry forests of the Deccan, Khandesh and Guzerat, absent from North Kanara, often cultivated. Fl. Nov.-Dec. Fr. ripe March.

A large or small evergreen tree. Wood light brownish-red, very hard, tough, even-grained and durable. Pores very small, in wavy radial lines. Medullary rays fine, uniform, very numerous, crosssed by very fine, concentric, wavy lines of light-coloured tissue. Weighs 70 lbs. to the cub. ft. A valuable timber used or sugar mills, oil presses, panelling and furniture also useful for turning.

Order LVI.—EBENACEÆ.

Trees or shrubs. Juice not milky. Leaves alternate, entire, often coriaceous. Flowers usually dicœcious, regular, axillary; pedicels articulated under the flower. Calyx inferior, gamosepalous, sometimes accrescent in fruit. Corolla gamopetalous, often hairy without. Stamens as many or 2-3-times as many as the corolla-lobes; filaments free, paired or otherwise united; staminodes in the female flower resembling stamens or O. Ovary superior; cells as many or twice as many as the styles, imperfectly septate; ovules usually 1 in each cell, attached to the inner angle of the cells, pendulous; styles 2-8. Fruit coriaceous or fleshy, indehiscent, 1 or few-seeded. Seeds large, pendulous, longitudinally furrowed; albumen equable or ruminate; embryo axile; radicle superior.

An Order containing the important genus *Diospyros* which yields various kinds of Ebony and other useful timbers.

Flowers 3-merous. Ovary 3-6-celled	1.	Maba.
Flowers 4-5-merous. Ovary 4-5- or 8-10-celled	2.	Diospyros.

1. MABA, J. R. & G. FORST.

Trees or shrubs; young parts hairy. Leaves alternate. Flowers small, dicœcious, axillary, solitary or few together. Calyx campanulate, 3-partite or 3-fid, sometimes enlarged in fruit. Corolla-tube cylindrical, longer than calyx; lobes 3, twisted to the right. Male fl.: Stamens 3 or numerous, often 9; filaments inserted at the base of the corolla, unequal, distinct or united. Ovary rudimentary. Female fl.: Staminodes 0-12. Ovary 3-celled; ovules 6; styles simple or 3-branched. Fruit globose, dry or fleshy, 1-6-celled, 1-6-seeded; albumen not ruminate.

Ovary densely-hairy	1.	M. nigrescens.
Ovary glabrous	2.	M. micrantha.

1. M. nigrescens, Dalz. & Gibs. Bomb. Fl. 142; Fl. Br. I. 3, 551; Cooke Fl. Pres. Bomb. 2, 97; Gamble Ind. Timb. 453. *Rakta-rohida, rakta-rora,* M.; *Kula-jhad, kari,* Kon.; *Hole-kuncha,* K.

A small tree or large shrub; young parts rufous-hairy. Leaves ovate-lanceolate, 1·25″-2·5″ by ·60″-1″, acute or obtuse at the apex, acute at the base, coriaceous, nearly glabrous, shining above, paler beneath; midrib strong, pubescent beneath; nervation slender, reticulate, distinct; petioles rufous-hairy,

·2″ long. Male fl.: Cymes short, axillary, 1-5-flowered. Calyx-lobes 3-4, broadly triangular, acute, ·2″ long, rufous-hairy. Corolla white, ·3″ long; lobes orbicular, as long as the tube, with a dorsal tuft of hairs. Stamens 4-9, glabrous; filaments slender; anthers linear, acute. Rudimentary ovary globose, rufous-hairy. Female fl. solitary or in pairs, 3-merous. Calyx and corolla with broader lobes otherwise like the male. Ovary ovoid, 3-celled, densely rufous-hairy; style as long as the ovary; stigma cup-shaped. Staminodes 0. Fruit ovoid, brown, glabrous, ·3″ long, seated on the lobed, cup-shaped calyx.

Western ghàts from the Konkan to Mysore; rain-forests of the Konkan and North Kanara, common on the ghâts near Nilkund and the falls of Gairsoppah. Fl. Dec.-Feb. Fr. Apl.- May.

A small tree or large shrub. Bark grey, rough, tubercled; inner-bark black. Wood greyish-brown, hard. Pores small, scanty, in oblique lines. Medullary rays very fine, numerous, crossed by wavy, concentric lines of soft tissue.

2. M. micrantha, Hiern. in Trans. Camb. Phil. Soc. XII, 133; Fl. Br. I. 3, 552; Cooke Fl. Pres. Bomb. 2, 98; *Holochilus micranthus*, Dalz. & Gibs. Bomb. Fl. 142; Bedd. Fl. Sylv. 147.

A medium-sized-tree with glabrous branchlets. Leaves ovate or elliptic-oblong, 3·5″-5″ by 1·25″-2″, narrowed at both ends, coriaceous, glabrous; petioles ·25″ long. Male flowers unknown. Female fl.: Calyx tubular, ·12″ long, truncate, subentire. Corolla tubular, divided to near the middle. Staminodes 6, distinct. Ovary 6-celled, glabrous; styles 3, erect, thick, obtuse at the apex. Fruit 6-celled, 6-seeded, 1″ by ·3″, seated on the broad, funnel-shaped, truncate, enlarged calyx. Description taken from the Fl. Br. I.

A small or moderate-sized tree on the Southern ghâts; not found by any collector since Dalzell who only discovered the female. Fl. in Feb. & Mch.

2. DIOSPYROS, L.

Trees. Leaves entire, usually alternate. Flowers usually dicœcious, axillary, 4-5-merous, rarely trimerous. Calyx usually larger in the female flower; lobes 4-5, often accrescent in fruit. Corolla tubular or urceolate; lobes 4-5, twisted to the right in bud. Male fl.: Stamens 4-64, often 16; filaments usually unequal, distinct or connate in pairs, the inner shorter; anthers narrow, often apiculate. Ovary rudimentary. Female fl.: Staminodes 0-16. Ovary 4-10-celled; cells 1-ovuled; styles or stigmatic-branches 1-4. Fruit globose, ellipsoid or ovoid, 2-10-seeded, often supported by the enlarged calyx. Seeds oblong, compressed; albumen horny, equable or ruminated; cotyledons foliaceous; embryo small.

Calyx sub-similar in both sexes. Corolla narrowly tubular in bud. Albumen equable.
Corolla pubescent outside.
Calyx divided to the base. Fruit clothed with stinging hairs ... ... 1. D. pruriens.
Calyx-tube truncate. Fruit not clothed with stinging hairs ... ... 2. D. oocarpa.
Corolla glabrous outside.
Corolla angled and usually curved in bud.
Stamens 24-32, in 8 bundles of 3 or 4 each... 3. D. assimilis.
Corolla straight in bud, not angled.
Stamens 16, glabrous. A spinous tree ... 4. D. montana.
Stamens 40, pilose. An unarmed tree ... 5. D. Embryopteris.

Calyx sub-similar in both sexes, larger in the female.
Corolla small, sub-globose in bud, urceolate when expanded. Albumen ruminate or equable.
Corolla glabrate without.
Albumen ruminate. Male flowers in small, congested, many-flowered cymes ... ... 6. D. sylvatica.
Corolla-lobes ciliate on the margins. Albumen equable. Male flowers in small, 3-flowered cymes. Fruit 1-seeded ... ... 7. D. microphylla.
Corolla glabrous without. Albumen equable.
Male flowers sub-sessile, fascicled, 4-10 together.
Fruit 2-3-seeded ... ... 8. D. Chloroxylon.

Calyx dissimilar in the 2 sexes, larger in the female.
Corolla ovoid-tubular in bud. Albumen ruminate.
Male flowers in short peduncled cymes.
Corolla yellow-lanate without. Fruit about 1″ in diameter ... . 9. D. Melanoxylon.
Corolla fulvous-silky without. Fruit about 2″ in diameter ... ... 10. D. crumenata
Male flowers fascicled.
Corolla yellow-tomentose without ... ... 11. D. Candolleana.
Male flowers panicled.
Corolla black-velvetty without ... . 12. D. paniculata.

1. D. pruriens, Dalz. in Hook. Kew Jour. Bot. IV, 110; Fl. Br. I. 3, 553;

Dalz. & Gibs. Bomb. Fl. 141; Bedd. Fl. Sylv. 144; Cooke Fl. Pres. Bomb. 2, 102; Gamble Ind. Timb. 454.

A small, cinerous-barked tree; branchlets and young parts covered with spreading, bristly hairs. Leaves bifarious, obovate or elliptic-lanceolate, 1″-4″ by ·75″-1·60″, acute at the apex, obtuse or cordate at the base, thinly coriaceous, yellowish or reddish-hirsute on both sides particularly on the midrib and venation; petioles very short. Male fl.: Peduncles axillary, 1-2-flowered, about ·75″ long; pedicels ·25″ long, articulated at the base; bracts small, caducous. Calyx-lobes 4-5, broadly ovate, ·5″ by ·2″, acute at the apex, covered with short, stiff hairs. Corolla about ·5″ long; lobes 4, oblong, obtuse, about as long as the tube, hairy outside, glabrous within. Stamens 14, unequal, connate at the base, shorter than the corolla-tube. Rudimentary ovary densely hairy. Female fl. solitary, arranged at the ends of the branches in the axils of the leaves; peduncles ·25″ long. Calyx 4-5-divided to near the base; lobes ovate-acute, hairy on both sides, Corolla ·6″ long, constricted about the middle; lobes linear acute, about as long as tube, hairy on the outside, glabrous within. Staminodes 4, small. Ovary covered with grey, stiff hairs, 4-celled; cells each with 1 ovule. Fruit conical-ovoid, about ·75″ long, covered with stinging hairs; calyx-lobes beneath deflexed, not enlarged.

Western ghâts from Kanara to the Bababuden hills in Mysore, locally distributed also found in Ceylon; Southern ghâts of North Kanara, fairly common near Mulamane on the Gairsoppah ghât where it occurs in rain-forest in the lower tree-storey. A small tree with characteristic, black-scaly bark, cylindrical trunk about 1′ in diameter and a pyramidal crown. Fl. Nov.-Feb. Fr. H. & R. S.

2. D. oocarpa, Thwaites Enum. Ceyl. Pl. 180; Fl. Br. I. 3, 560; Trimen Fl. Ceyl. 3, 97; Cooke Fl. Pres. Bomb. 2, 101; Gamble Ind. Timb. 459.

A moderate-sized tree; branchlets minutely puberulous. Leaves ovate, 2·5″-4·5″ by 1·5″-2·5″, bluntly long-acuminate, acute at the base, thinly coriaceous, glabrous, dark-green shining above, paler beneath; midrib prominent beneath; lateral-nerves about 12 pairs, oblique, slender and inconspicuous; petioles about ·5″ long. Male fl. subsessile or very shortly pedicelled, in short, congested, few-flowered, bracteate, axillary cymes; bracts ovate, concave, red silky-hairy, imbricate in bud. Calyx ·2″ long, subtruncate or obtusely 3-lobed at the top, red silky-hairy on the outside. Corolla ·3″ long, tubular, tomentose outside; lobes ovate-oblong as long as the tube and deeply imbricate in bud. Stamens 9-12, alternately unequal; anthers short, apiculate. Female fl. 1-3 together, larger than the male. Calyx cup-shaped, truncate. Ovary 6-8-celled. Fruit ellipsoid, ·75″-1″ long, pointed at the top; seated on the flat, cup-shaped calyx; surface rough, lobulate; seeds oblong; albumen uniform.

Konkan to Mysore and low country of Ceylon. In the rain-forests of North Kanara and the Konkan; common on the ghâts about Karwar (Godhuli, 1500′-1700′) and Ainshi. Fl. Jan.-Mch. Fr. ripe June. A small or moderate-sized tree. Bark dark-coloured, thin, smooth. Wood purplish-brown with black streaks, moderately-hard, handsome. Pores moderate-sized to large, not numerous, often subdivided. Medullary rays very fine and numerous, crossed by numerous, fine, wavy, very faint, concentric lines. Weighs 45 lbs. to the cub. ft. Gamble states that the wood is like *Calamandar;* it deserves attention.

3. D. assimilis, ? Bedd. in Madras For. Rep. 1866-67. 20. t. 1; Fl. Br. I. 3, 558; *D. Ebenum,* Kœnig; Cooke Fl. Pres. Bomb. 2, 103; *D. nigricans?*; Dalz. & Gibs. Bomb. Fl. 146; *Ebony. Kari-mara*, K.; *Abnus, malia*, M.

Fig 376. Diospyros assimilis, Bedd. ? ♀

Resumé of a report from Kew on a series of specimens of the above plant collected in N. Kanara is as follows. "There appears to be no authoritative specimens of *D. assimilis*, Bedd. either at Kew or in the British museum. *D. nigricans*, Bedd. Ic. Pl. Ind. Or. t. 124 is not *D. nigricans*, Dalz. The specimens received are not *D. nigricans*, Dalz. It seems probable that either the specimens received or *D. nigricans*, Dalz, may be true *D. assimilis*, Bedd. and in that case one of these plants would be *Diospyros sp. nov.*" The curator informs me after a careful search through Col. Beddome's herbarium that there are no specimens of *Diospyros assimilis*, Bedd. in the Madras museum.

A large or medium-sized tree. Leaves with rough, lenticellate, glabrous branches. Leaves ovate or oblong-lanceolate, 2·25″-5″ by 1″-2″, obtuse or very shortly acuminate at the apex, acute or obtuse at the base, thinly coriaceous, glabrous, green, shining above, paler beneath, drying light-brown not black; lateral-nerves slender, about 8 pairs, lowest 2 pairs basal; petioles ·25″ long. Male fl. 3-6, axillary, fascicled or cymose, on axillary, often congested, short, tomentose peduncles which are also furnished with a few large, hermaphrodite flowers possessing the calyx of the female; buds ·25″-·5″ long, linear, tapering, straight or curved and more or less quadrangular; bracts small, caducous. Calyx 4-5-lobed, ·15″ long; lobes broad-ovate, obtuse, pubescent within and ciliate on the margins. Corolla white, ·5″ long; tube inflated at the base, longer than the obtuse, linear-oblong lobes. Stamens 24-32 inserted at the base of the corolla-tube; filaments unequal, connate in 8 bundles or phalanges; connective apiculate. Female fl. sessile, subsolitary, axillary or arranged along the branches below the leaves. Calyx 4-lobed, larger than in the male; tube short, cup-shaped; lobes each with the lower half very thick and attached at the base to the tube, densely red-tomentose within, prolonged in an elevated marginal ring above; the upper part of the lobes is at right angles to the lower or sometimes more deflexed, margins induplicate. Corolla shorter than in the male. Ovary glabrous, 8-celled; styles 8. Staminodes 8-13 inserted at the base of the corolla-tube. Hermaphrodite fl.: Calyx nearly as in the female. Corolla larger than in the male, curved and quadrangular in bud. Stamens about 37 in bundles or phalanges of 2-5 each. Ovary conical; styles 2. Fruit ovoid or subglobose, 1″ long by ·5″ broad, acute at the top, seated on the cup-shaped, 4-lobed calyx; seeds about 8, black; albumen equable.

Western ghâts from the Konkan to Malabar; in the rain-forests of the Konkan and North Kanara. (Kumpta and Siddapore talukas.) Fl Feb., Mch. Fr. H. S. Bark very thin, cinerous, rather smooth or sometimes rough, lenticellate, with longitudinal cracks. Only old trees produce ebony. Sapwood white, compact, heavy; heartwood ebony-black, sometimes a little streaky. Pores small, in a few, scattered, radial lines. Medullary rays wavy, very fine, numerous, crossed by fine wavy lines of light tissue, not distinct in the ebony. Weighs 60 lbs. to the cub. ft. Wounds in growing trees turn quickly an ebony colour. This usually moderate-sized tree yields the ebony used for wood-carving in Kumta and Honavar, North Kanara District. The quality of the North Kanara ebony is good, but large pieces are rare.

4. D. montana, Roxb. Fl. Ind. 2, 538; Fl. Br. I. 3, 555; Gamble Ind. Timb. 454; Dalz. & Gibs. Bomb. Fl. 142; Brandis For. Fl. 296; Bedd. Fl. Sylv. 143; *D. cordifolia,* Willd.; Bedd. Fl. Sylv. 143; Cooke Fl. Pres. Bomb. 2, 105; *D. Goindu,* Dalz. & Gibs. Bomb. Fl. 141. *Tendu, bulguni, kalagunda,* K.; *Tembhurni, govindu, lohari,* M.; *Hadru,* Vern.; *Temra,* Panch Mahals.

A small or moderate-sized, usually spinous tree; branchlets softly pubescent or brown-tomentose. Leaves variable, ovate or elliptic-oblong, 2·5″-4″ by ·75″-2″, acute or obtusely-acuminate at the apex, obtuse or cordate at the base, thinly coriaceous, tomentose when young; glabrous when old; lateral-nerves about 10 pairs; petioles ·25″-·5″ long, more or less tomentose. Male fl. usually 2-6, in short, axillary, or extra-axillary, bracteate cymes ·5″-·75″ long; pedicels very short; bracts linear, tomentose, caducous; buds ovoid pointed. Calyx-lobes 4, broadly-ovate, obtuse, tomentose and ciliate on the margins. Corolla white, urceolate, twice as long as the calyx, tomentose outside; lobes 4, shorter than the tube, spreading. Stamens 16 in 2 rows of 8 each, united in pairs; the inner anthers sessile, the outer with short filaments; connectives of this row cuspidate and shortly exserted. Female fl. solitary, axillary, larger than the males, on stout, nodding pedicels about ·1″ long with 2 small bracts at the top. Calyx-lobes glabrous, ·25″ long, broad-ovate, obtuse. Corolla as in the male. Staminodes 4-8-12. Ovary glabrous, 8-celled; cells 1-ovuled; styles 4, notched at the apex. Fruit globose, ·75″-1″ in diameter, brown or yellow-shining, pointed at the apex, seated on the enlarged, lobed, leathery, brown calyx; seeds 2-8, ·4″ long, rough, black; albumen equable.

Fig 377. Diospyros montana, Roxb.

From the Himalayas to Ceylon and Tenasserim (var. *cordifolia*); scattered throughout the dry deciduous Deccan and Konkan forests also found in N. Kanara in monsoon-forest at the sea-level and along the ghâts, often on laterite, but nowhere abundant. A very variable tree of which the tomentose form (var. *cordifolia*) is considered by many botanists a distinct species. Brandis mentions in his Indian Trees 2 other varieties or closely allied new species from Upper Burmah. Fl. Mch.-Apl. Fr. ripe R. S.

A small or moderate-sized very thorny tree; spines branched or simple. Bark smooth or scaly at base of stem; inner-bark turning bright-yellow on exposure. Wood yellowish-grey, streaked with lines and patches of darker tissue near the centre of the tree but without any ebony heartwood, smooth, moderately hard and durable. Pores small, in short radial lines. Medullary rays very fine, numerous, equidistant, crossed by very faint, wavy, fine, white, parallel, transverse lines. Weighs about 54 lbs. to the cub. ft. Timber not much used in North Kanara.

5. D. Embryopteris, Pers. Syn. 2, 624; Fl. Br. I. 3, 556; Brandis For. Fl. 298; Bedd. Fl. Sylv. t. 69; Cooke Fl. Pres. Bomb. 2, 106; Gamble Ind. Timb. 455. *Timburi, temburni,* M.; *Gab, kusi, tendu, zeeberwo,* Vern.; *Kusharta, hagna, huli-tumri, gavandu,* K.

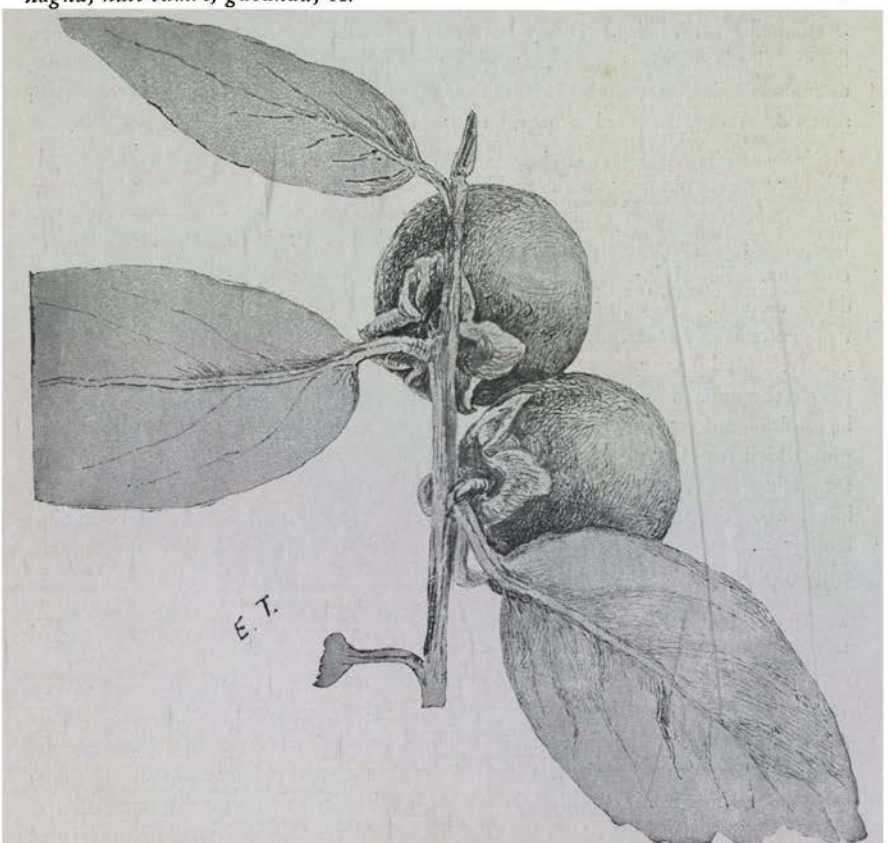

Fig 378. Diospyros Embryopteris, Pers.

A moderate-sized tree; young parts silky. Leaves lanceolate-oblong or oblong, 5″-9″ by 2″-2·5″, obtuse or subacute at the apex, rounded, sometimes subcordate at the base, very coriaceous, glabrous shining; nervation reticulate, not prominent; petioles ·25″-·5″ long, stout, channelled and wrinkled. Male fl.: 2-7 together in short, pubescent, racemose, drooping cymes. Calyx shallow cup-shaped, ·25″ long, hirsute; lobes 4, broad, pubescent inside; margins ciliate. Corolla broadly campanulate, ·4″ long; lobes 4, thick, spreading, each with a tuft of hairs at the back. Stamens 24-64, inserted in pairs at the base of the corolla-tube; anthers with a line of hairs at the middle. Disk fleshy, lobed. Female fl. much larger than in the male, 1″ across, solitary, axillary, on short, drooping pedicels. Calyx broadly ovate, cordate at the base, glabrous. Corolla ·5″ long, campanulate; lobes 4, cordate at the base, obtuse at the apex, recurved. Staminodes 1-12, hairy. Ovary glabrous or hairy, 8-celled; styles 4; stigmas lobed. Fruit nearly globose, 1·5″-3″ in diameter, yellow, covered with rusty, deciduous hairs, seated on the much enlarged, leathery, spreading, reflexed calyx; seeds 8, oblong, flattened, brown, immersed in viscid pulp; albumen equable.

India from the Himalayas to Ceylon and Tenasserim, common in Bengal; Western peninsula near creeks and back-waters along the coasts of North Kanara and the Konkan also in rain-forest and in the beds of rivers and streams on the ghàts; often cultivated as an ornamental tree or for its valuable fruit, nowhere common. Fl. Mch.-May. Fr. Dec. A small evergreen tree. Bark smooth, dark-coloured. Wood grey or brown with black streaks or irregular patches near the centre of old trees, moderately hard, compact and close-grained. Pores small, scanty. Medullary rays very fine, distinct, numerous, equidistant. Weighs 54 lbs. to the cub. ft. Beddome states that the wood is used for building purposes in Madras and for masts and yards of country vessels in Ceylon. An excellent glue which is obtained from the viscid pulp of the fruit serves as a substitute for tar for paying the seams of native craft; it is also employed in book-binding. An infusion of the unripe fruits which contains much tannin is used for tanning leather and dyeing also for strengthening fishing nets, lines etc. and is also employed in native medicine.

6. D. sylvatica, Roxb. Fl. Ind. 2, 537; Fl. Br. I. 3, 559; Bedd. Fl. Sylv. 143; Cooke Fl. Pres. Bomb. 2, 100; Gamble Ind. Timb. 457. *Kurnal,* K.

A small or moderate-sized tree; buds silky. Leaves elliptic-ovate, 2″-4″ by 1″-2″, acute both at the base and apex, thin, glabrous, drying black; lateral-nerves about 8 pairs, distinct on both sides; petioles ·25″ long. Male fl. 4-merous on peduncled, axillary, short, many-flowered, cymose clusters, about 1″ long; pedicels bracteate at the base. Calyx-lobes very small, puberulous, obtuse. Corolla white, urceolate, ·12″ long, globose in bud; lobes equalling the tube. Stamens 13-22, usually in pairs; anthers tapering at the apex. Female fl.

solitary, shortly pedicelled, twice as large as the male. Calyx green; lobes ·25″ long. Corolla urceolate. Staminodes 4 on the corolla-tube and alternate with its lobes. Ovary 6-8-celled; cells 2-ovuled; styles 3-4; stigmas spreading. Fruit dark-green, globose, ·5″-·75″ in diameter, seated on the woody cup-shaped, accrescent calyx; seeds 2-8, oblong, rugose, brown, shining; albumen ruminate.

Western ghàts from Bombay to Ceylon, ascending to 3000′ in the rain-forests of the Konkan and North Kanara; common in the Yellapur and Siddapore sub-divisions. Fl. Jany.-Feb. Fr. ripe Sept.-Oct. A medium-sized tree, 60′ high by 1·5′ in diameter, sometimes buttressed. Bark dark-coloured, thin, smooth; inner-bark yellow. Wood white or grey with streaks and black patches near the centre in old trees. Pores scanty, in short, radial, echeloned lines. Medullary rays and transverse bars fine and distinct.

7. D. microphylla, Bedd. Fl. Sylv. 145; Fl. Br. I. 3, 559; Cooke Fl. Pres. Bomb. 2, 104; Gamble Ind. Timb. 458; *D. buxifolia*, Hiern, Monogr. Eben. 218. *Dula*, *kuri-koonchal,* K.

Fig 379. Diospyros microphylla, Bedd.

A large tree; branchlets verticellate, covered with long, yellowish hairs. Leaves elliptic-ovate, ·5″-1·5″ by ·3″-·5″, acute or obtusely- acuminate at the apex, acute at the base, coriaceous, glabrous, shining above, sparsely adpressed hairy beneath, soon glabrescent; petioles ·1″-·15″ long. Male fl. small, ·1″ in diameter, on minute, 3-flowered, axillary, often deflexed cymes. Calyx minute, 4-lobed; lobes hirsute on the outside. Corolla white, urceolate, ·3″ long; lobes ciliate on the margins. Stamens 16; filaments united in pairs, inner shorter; anthers ovate, dehiscing by apical slits. Rudimentary ovary hirsute. Female fl. solitary, axillary. Calyx more deeply lobed than in the male. Staminodes 0. Ovary glabrous, 4-celled; cells 1-ovuled; stigmas 2. Fruit cylindrical, pointed at the apex, glabrous, ·3″ long, seed 1; albumen equable.

Western ghàts, from North Kanara to the Mysore and Anamallay hills, ascending to 3000′; rain-forest of North Kanara; common on the Yellapur ghâts. Fl. H. S. Fr. C. S. A large tree, 80′-100′ high and 3′ in diameter, buttressed at the base. The leaves have a certain resemblance to those of the Box. Bark dark, scaly; inner-bark red, fibrous, soft. Wood reddish-grey, moderately hard and smooth. Pores moderate-sized, sometimes in obliquely arranged, continuous, radial lines with marked intervals between the pores. Medullary rays very fine and indistinct; cross-bars fine and close also indistinct. Weighs 46 lbs. to the cub. ft. Timber not used in North Kanara; it quickly decays on exposure.

8. D. Chloroxylon, Roxb. Fl. Ind. 2, 538; Fl. Br. I. 3, 560; Dalz. & Gibs. Bomb. Fl. 140; Brandis For. Fl. 297; Bedd. Fl. Sylv. 140; Cooke Fl. Pres. Bomb. 2, 105; Gamble Ind. Timb. 458. *Nensi,* Vern. (Surat, Nasik); *Ninai,* M.

A small, sometimes spinescent tree; branchlets tomentose. Leaves elliptic-oblong, 1″-2·25″ by ·5″-1·25″, rounded at both base and apex, thinly-coriaceous, pubescent above, tomentose beneath; lateral-nerves inconspicuous; petioles ·1″-·25″ long. Male fl. 4-merous, white-hairy, subsessile, fascicled generally in threes on shortly hairy peduncles; bracts small, ovate, hairy. Calyx deeply 4-lobed; lobes about ·1″ long, hairy-strigose. Corolla white, 4-lobed: lobes acute, each with a line of hairs on the outside, otherwise glabrous. Stamens 16 in 2 rows; inner shorter; anthers ovate-acute as long as the filaments. Rudimentary ovary very hairy. Female fl. 4-merous, solitary, sessile or subsessile. Calyx strigose. Corolla glabrous; lobes ciliate. Staminodes 7-9, glabrous. Ovary glabrous, 8-celled; cells 1-ovuled; styles 4. Fruit globose, smooth, shining, ·3″ in diameter, seated on the shallow, cup-shaped, lobed, strigose calyx; seeds 2-3; albumen equable.

Central and Southern India from Guzerat southwards; Orissa, Circars, and the Carnatic; Deccan, common in the Nasik district in dry deciduous forests; absent from the Konkan and North Kanara. Fl. June. Fr. Jan.-Mch. A small tree. Bark dark-brown, rough with small, rectangular, corky scales. Wood yellowish with dark-coloured patches, moderately hard and durable. Pores small, in radial, echeloned, discontinuous strings. Medullary rays fine, numerous, distinct, crossed by fairly distinct transverse bars. Yields good fodder. The fruit is edible.

9. D. Melanoxylon, Roxb. Fl. Ind. 2, 530; Fl. Br. I. 3, 564; Brandis For. Fl. 294; Bedd. Fl. Sylv. t. 67; Cooke Fl. Pres. Bomb. 2, 99; Gamble Ind. Timb. 461; *D. exsculpta,* Ham.; Dalz. & Gibs. Bomb. Fl. 142; Bedd. Fl. Sylv. t. 66; *D. Tupru,* Buch. Ham. Jour. 1. 183; Fl. Br. I. 3, 563; *D. tomentosa,* Roxb. Fl. Ind. 2, 532; Fl. Br. I. 3, 563. *Balai,* K.; *Timburni, Tendu,* M.; *temru,* Vern. *Tamruj,* Guz. *Coromandel Ebony.*

A small or moderate-sized tree; young parts yellowish-tomentose. Leaves alternate or mostly subopposite, ovate-elliptic, 3″-6″ by 1·75″-3″, obtuse both at the apex and base, very coriaceous, glabrous-shining above, tomentose beneath; lateral-nerves 6-8 pairs, irregular and prominent beneath; petioles ·25″-·5″ long. Male fl. 4-merous, in shortly peduncled, axillary or extra-axillary, 3-12-flowered, tomentose, drooping cymes; bracts subulate. Calyx ·2″ long, campanulate, tomentose; lobes shorter than the tube, subacute at the apex. Corolla tubular, about twice as long as the calyx, tomentose without, glabrous within. Stamens 12-16, free, in a circle on the disk. Female fl. 4-5-merous, subsessile, solitary, axillary, somewhat longer and larger than the male. Calyx hairy on both sides. Corolla as in the male, shortly divided into 4-5-lobes. Staminodes 8-10. Ovary densely yellow-hairy, 4-8-celled; cells 1-ovuled; styles 2-3, bifid. Fruit globose or ovoid, yellow, glabrous, 1″-1·5″ in diameter; pulp yellow, sweet, edible; very astringent before maturity; seeds 4-8, compressed, brown-shining, sometimes with bands across; albumen ruminate.

Deccan peninsula to Ceylon; common in the dry deciduous forests of the presidency. Fl. Apl.-May. Fr. ripe December. A moderate-sized tree. Rhytidome divided into thick plates of hard, black, cinerous tissue, separated by thin whitish, corky layers; inner-bark reddish. Sapwood reddish, tough and durable. Pores few, small, in short radial lines. Medullary rays very fine, equidistant, with faint, wavy cross-bars of lighter-coloured tissue. Weighs 54 lbs. to the cub. ft. The ebony is in irregular, jet-black masses, often with purple streaks. N. Kanara trees 16″ in diameter growing on schistose soil sometimes yield as much as 8″ of ebony. Used for carving, &c. The white wood is employed for building purposes, carriage shafts, &c. Fruit edible when quite ripe. Leaves serve as plates in the Khandesh and Kanara districts.

10. D. crumenata, Thw. Enum. 179; Bedd. Ic. Pl. Ind. Or. t. 162; For. Man. 145; Talb. Jour. Bomb. Nat. Hist. Soc. XI, 693, t. 14; Fl. Br. I. 3, 567; Cooke Fl. Pres. Bomb. 2, 191; Gamble Ind. Timb. 462; Trimen Fl. Ceyl. 3, 102. *Kan-tumri*, K.

A very large, evergreen tree; young parts glabrous. Leaves ovate-elliptic, 2″-6″ by 1″-2·5″, obtuse or bluntly acuminate at the apex, rounded or subacute at the base, drying brown, coriaceous, glabrous, shining; midrib depressed on the upper side, prominent on the lower; venation reticulate, conspicuous; petioles ·25″-·4″ long. Male fl. ·3″ long, in short, 3-5-flowered, drooping, peduncled, hairy cymes. Calyx tubular, tomentose, shortly 4-toothed; teeth shallow, acute. Corolla tubular, creamy-white, silky-tomentose; lobes half the length of the tube, spreading or recurved. Stamens 12, glabrous; filaments very short; anthers apiculate. Female fl. solitary, axillary, larger than and dissimilar to the male, articulated on short, stout peduncles about ·25″ long. Calyx ·3″ long; lobes

deeply plicate. Corolla tubular, fulvous-hairy outside, longer than the calyx; lobes 4, acute; margins undulate. Staminodes 6-8, inserted at the base of the corolla-tube. Ovary hairy, 8-celled; cells each with 2 ovules; stigmas 4. Fruit

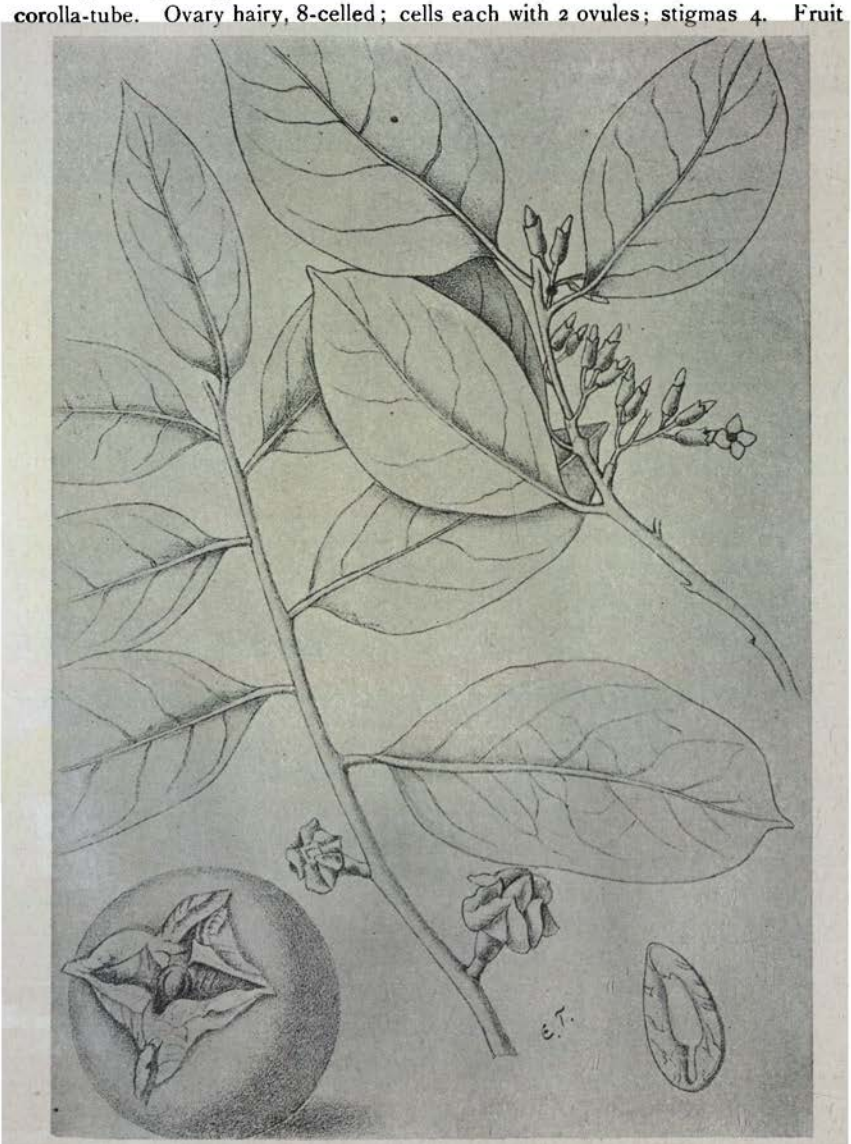

Fig 380. Diospyros crumenata, Thw.

globose, 1·5″-2″ in diameter, glabrous, seated on the enlarged, lobed and woody calyx; seeds 6-8, immersed in a stringy, glutinous pulp, 1″ by ·5″, flattened, black and shining; albumen ruminate.

Moist region of Ceylon at 2-400′ elevation, rather rare; common in North Kanara in rain-forest between the Gairsoppah and Dodmune ghâts. Fl. and Fr. H. S., March-May.

A very large tree with a cylindrical trunk 100′-150′ high, and 4′-5′ in diameter at the base. Bark thin, scaly, cinerous. Wood reddish, close-grained, tough and hard. Pores few, medium-sized. Medullary rays numerous, very fine; transverse-bars indistinct. No ebony heart-wood, even in the largest trees. Weighs 54 lbs. to the cub. ft. Wounds in the trunk caused by broken branches or cutting instruments rapidly turn very black. *D. pruriens* and several other species of *Diospyros* act in a similar manner, locally forming a kind of black ebony-like wood.

11. D. Candolleana, Wight Ic. t. 1221-2; Fl. Br. I. 3, 566; Dalz. & Gibs. Bomb. Fl. 142; Bedd. Fl. Sylv. 144; Cooke Fl. Pres. Bomb. 2, 100; Gamble Ind. Timb. 462; *D. canarica*, Bedd. Fl. Sylv. 145. *Kalwan,* M.; *Kari-gidda,* K.

A small or moderate-sized tree; young parts, buds etc. pubescent with hairs fixed by the centre. Leaves elliptic or obovate-oblong, 5″-9″ by 1·5″-3″, bluntly-acuminate at the apex, acute, rounded or sometimes cuneate at the base, coriaceous, glabrous shining; midrib prominent beneath, depressed above; nervation somewhat obscure; petioles ·5″ long. Male fl. sessile, in silky, rusty-tomentose, axillary fascicles. Calyx tubular, ·2″ long, 5-cleft half-way, fulvous-pubescent outside, glabrous within; lobes subacute. Corolla twice as long as the calyx, tubular, sometimes curved in bud, silky-hairy outside, glabrous within; lobes 5, shorter than the tube. Stamens 10, unequal, in 5 pairs, inserted at the base of the corolla-tube; anthers triangular, acute. Rudimentary ovary minute, hairy. Female fl. larger than the male, sessile, in few-flowered, axillary clusters. Calyx-lobes ·25″ long, fulvous silky-hairy on both sides; margins reflexed. Corolla as in the male. Staminodes 4-5-10 in pairs, unequal. Ovary 4-celled; styles 2-5, short. Fruit ovoid, glabrous, about 1″ long, seated on the cup-shaped, enlarged calyx; seeds 3-4, brown; albumen horny in the centre, ruminate.

Western ghâts from the Konkan to Ceylon; throughout the Konkan and North Kanara in evergreen forests, common near the coast at Karwar. Fl. Apl. July. A small tree often associated with *Eugenia caryophyllæa* in the littoral forests near the Kanara sea-coast. Wood olive-green or yellowish, soft, light, smooth. Pores small, not numerous, equally distributed. Medullary rays moderately broad and fine, crossed by very distinct, fine, wavy, continuous, close bars of light-coloured tissue. Weighs about 40 lbs. to the cub. ft. The rays are

much broader than in any of the other species of *Diospyros* I have examined. Fruit Nov.-Dec.

12. D. paniculata, Dalz. & Gibs. Bomb. Fl. 141; Fl. Br. I. 3, 570; Bedd. Fl. Sylv. 114; Cooke Fl. Pres. Bomb. 2, 102; Gamble Ind. Timb. 463. *Kurikoomar*, K.

Fig 381. Diospyros paniculata, Dalz.

A large or moderate-sized tree; branchlets angular, striate, glabrous; young parts covered with black, sooty hairs. Leaves oblong-lanceolate, 4″-6″ by 1·5″-2·75″, obtusely-acuminate at the apex, usually broad, obtuse or slightly cuneate at the base, thinly coriaceous, glabrous; lateral-nerves 6-8 pairs with conspicuous raised nervation; petioles ·5″ long, stout, grooved on the upper side. Male fl. about ·5″ long, in few-flowered, short-peduncled, axillary cymes; peduncles 1″ long. Calyx 5-lobed to the base; lobes ·3″ long, ventricose, broad-foliaceous, with a raised ridge on the inner side covered with sooty-black hairs. Corolla tubular, sooty-black hairy in bud; lobes as long as the tube, spreading. Stamens 20, in pairs at the base of the corolla-tube; filaments short; anthers acute. Female fl. solitary, axillary on the branches below the leaves; peduncles stout, ·5″ long, with 2 broad, caducous bracts about the middle. Calyx ·75″ long; lobes cordate, foliaceous, reticulately veined, nearly glabrous. Ovary 4-celled; cells 1-ovuled; styles 2, shortly lobed at the apex. Fruit ovoid, 1″-1·5″ long, covered

with short rusty hairs at length brown, glabrous, shining, strongly wrinkled, seated on the 5-lobed, auricled, plicate calyx; seeds ovoid; albumen equable, horny; cotyledons foliaceous.

In the rain-forests of the Konkan and North Kanara, frequent in the forests near the Nilkund and Gairsoppah ghàts. Fl. Nov.-Dec. Fr. Apl.-June. A tree with a cylindrical tall stem. Bark smooth, dark-coloured; inner-bark hard, reddish-brown, ·20″ thick. Wood white, no ebony heart-wood.

D. Kaki, Linn. f. Suppl. 434; Fl. Br. I. 3, 555; Grah. Cat. Bomb. Pl. 107. *Chinese Fig* or *Chinese Plum* or the *Keg Fig* of Japan. Cultivated near Bombay. Fruit yellow, with 2 almond-like stones, globose, about the size of an orange, edible. A native of the Khasia mountains, Upper Assam and Burmah.

D. quæsita, Thw. Enum. Pl. Zeyl. 179. A large tree from South India and Ceylon, furnishes the valuable and ornamental "*Calamander*" wood.

Order LVII.—STYRACACEÆ.

Trees or shrubs. Leaves alternate, simple, exstipulate. Flowers hermaphrodite, regular, usually in terminal or axillary spikes or racemes; bracts caducous. Calyx gamosepalous, campanulate, superior or inferior; limb 4-5-toothed or truncate, persistent. Petals 4-5, free or united into a very short tube. Stamens attached to the corolla-tube, in one or more series, 8-10 or many. Ovary more or less inferior, 2-5-celled, with two or more pedulous ovules in each cell; style undivided; stigma capitate, entire or lobed. Fruit drupaceous; stone 1-3-seeded. Seeds albuminous; embryo straight or curved.

SYMPLOCOS, LINN.

Trees or shrubs. Leaves alternate, toothed or entire, often drying yellow. Flowers in simple or compound racemes or spikes, usually yellow or white; bract solitary at the base of the pedicel; bracteoles 1-3 at the base of the flower. Calyx 5-lobed; lobes ciliate, imbricate. Petals 5, imbricate, free or connate. Stamens numerous in several series, adnate to the corolla-tube; filaments free or connate; anthers rounded or linear. Ovary inferior, 2-4-celled; ovules 2, pendulous from the inner-angle in each cell. Fruit a drupe with a woody 1-3-seeded endocarp, or stone, crowned with the calyx-lobes; seeds albuminous; embryo straight or curved; cotyledons much shorter than the radicle.

Symplocos contains many handsome flowering and foliage plants. *S. Beddomei*, for example when in full bloom is very ornamental. Some of the Ceylon and Southern Indian hill species are difficult of determination by means of the flowers only and further investigation into the relationship of closely allied species is necessary.

Fruit urceolate, blue-black; stone fluted	1.	S. spicata.
Fruit ovoid, yellow; stone ridged or not.		
Fruit ·3″ long; stone obtusely angled	2.	S. Beddomei.
Fruit 1·25″ long; stone narrowly 6-ridged ...	3.	S. kanarana.

1. S. spicata, Roxb. Fl. Ind. 2, 541; Var. *laurina,* Fl. Br. I. 3, 573; Brandis For. Fl. 300; Bedd. Fl. 149; Cooke Fl. Pres. Bomb. 2, 108; Gamble Ind. Timb. 465; *Hopea spicata,* Dalz. & Gibs. Bomb. Fl. 140. *Mirjoli, gowuli,* M.

A small or medium-sized tree; branchlets glabrous. Leaves ovate-lanceolate or elliptic, 3″-6″ by 1·25″-2·5″, acuminate or acute at the apex, acute at the

base, coriaceous or chartaceous, glabrous, turning yellow when dry, shallowly crenate-serrate; lateral-nerves about 8 pairs, not prominent; petioles ·25″ long. Flowers yellowish-white, sweetly-scented, closely sessile, in axillary, simple or branched, fulvous-tomentose spikes 1″-2″ long; bracteoles 3, minute, hairy, ciliolate, persistent. Calyx 1″ long; lobes rounded, pubescent or glabrous, as long as the glabrous tube. Corolla divided to quite near the base, ·2″ long. Stamens about 40. Disk glabrous. Ovary inferior; style slender; stigma capitate. Fruit globose, blue, ·2″ in diameter, crowned with a very short tube; stone 12-ribbed, 3-1-seeded.

Northern India in evergreen hill-forest up to 5000′; Western peninsula and Ceylon, common in shola-forest at the higher elevations. In the evergreen monsoon and rain-forests of the Konkan and North Kanara ghàts. Fl. Aug.-Dec. Fr. Mch.-Apl. Bark light-coloured, thin, smooth. Wood white, soft, evengrained. Pores small. Medullary rays numerous, very fine. The fluted seeds are strung into necklaces. The wood which is liable to split is only used for fuel in the Bombay Presidency.

2. S. Beddomei, C. B. C. in Fl. Br. I. 3, 582; Cooke Fl. Pres. Bomb. 2, 108; Gamble Ind. Timb. 464; *Hopea racemosa,* Dalz. & Gibs. Bomb. Fl. 140. *Lodhra, hura, sukaila, kawla,* M.; *Manithristi,* K.

A moderate-sized or large tree; branchlets glabrous, lenticellate. Leaves crowded at the ends of the branches, elliptic or oblong, 4″-7″ by 2″-2·75″ shortly acuminate or acute at the apex, more or less acute at the base, crenate, often subentire in the lower half, coriaceous, glabrous, dark-green shining above, paler beneath; lateral-nerves 8-10 pairs, prominent beneath, less so on the upper surface; petioles ·5″ long. Flowers white, very sweetly-scented, (like *Hawthorn,*) sessile or shortly pedicelled, in more or less tomentose or pubescent, sometimes fascicled, axillary spikes, 2″-5″ long; bract large, pubescent, ciliate, veined, early caducous; bracteoles 2, smaller than the bract, caducous but not so early as the bract, pubescent, ciliate. Calyx ·2″ long; tube short, green, glabrous; lobes white, petaloid ovate-obtuse, glabrous or pubescent. Corolla ·3″ across, divided nearly to the base, along with the attached stamens early caducous; petals 5-6 white, spreading, ovate-obtuse. Stamens about 100; filaments white, slightly flattened at the base, outer longest, attached in phalanges to the base of the petals; anthers yellow. Ovary white, hairy at the top, immersed in a ring of thick brown glands at the base; style thick, cylindric as long as the stamens; stigma flat, capitate, obscurely lobed. Fruit ovoid or subcylindric, ·5″ long by ·25″ thick, narrowed upwards and crowned with the persistent calyx-lobes, dark-blue, turning light-yellow when dry; stone woody, brown, rough, irregularly and obtusely angled, 1-3-seeded.

Western peninsula, on the ghàts from the Konkan to Kurg; along the borders of evergreen forests and in moist places near nalas throughout the Konkan and

North Kanara. Fl. and Fr. at different times throughout the year; in flower at Mahableshwar during November. Bark ·5″ thick, dark-grey, rough with large open lenticels; inner-bark white or yellowish with uniform fibrous tissue. Sapwood white; heart-wood light yellowish-brown with darker patches, soft and even-grained. Pores small, evenly distributed. Annual-rings indistinctly marked by rings of white tissue. Medullary rays moderately broad, short, with numerous very fine rays between. Weighs about 40 lbs. to the cub. ft. Used for firewood at Mahableshwar and Panchgani.

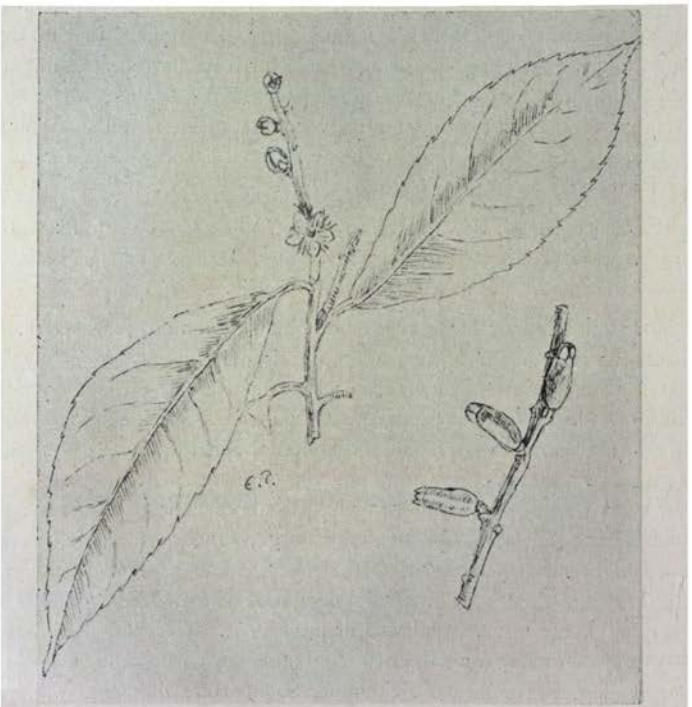

Fig 382. Symplocos Beddomei, C. B. Clarke.

3. **S. kanarana,** Talb.; Jour. Nat. Hist. Soc. Bomb. XI, 238. t. 12; Trees Bomb. (1902) 211; Cooke Fl. Pres. Bomb. 2, 109; Brandis Ind. Trees, 439.

A small tree; branchlets terete, glabrous, striate. Leaves elliptic-oblong, 3″-6″ by 1″-2·5″, long-acuminate, acute at the base, crenate-serrate, thinly coriaceous, glabrous shining above; lateral-nerves 5 pairs; petioles ·25″-·4″ long. Flowers white, sweetly-scented, ·2″ long, sessile or usually shortly pedicelled, in axillary, simple or branched racemes about 2·5″ long; rachis tomentose; buds

globose; bract small, ovate, acute, tomentose; bracteoles 2, minute, fulvous-hairy. Calyx-tube turbinate, glabrous; lobes obtuse, shorter than the tube,

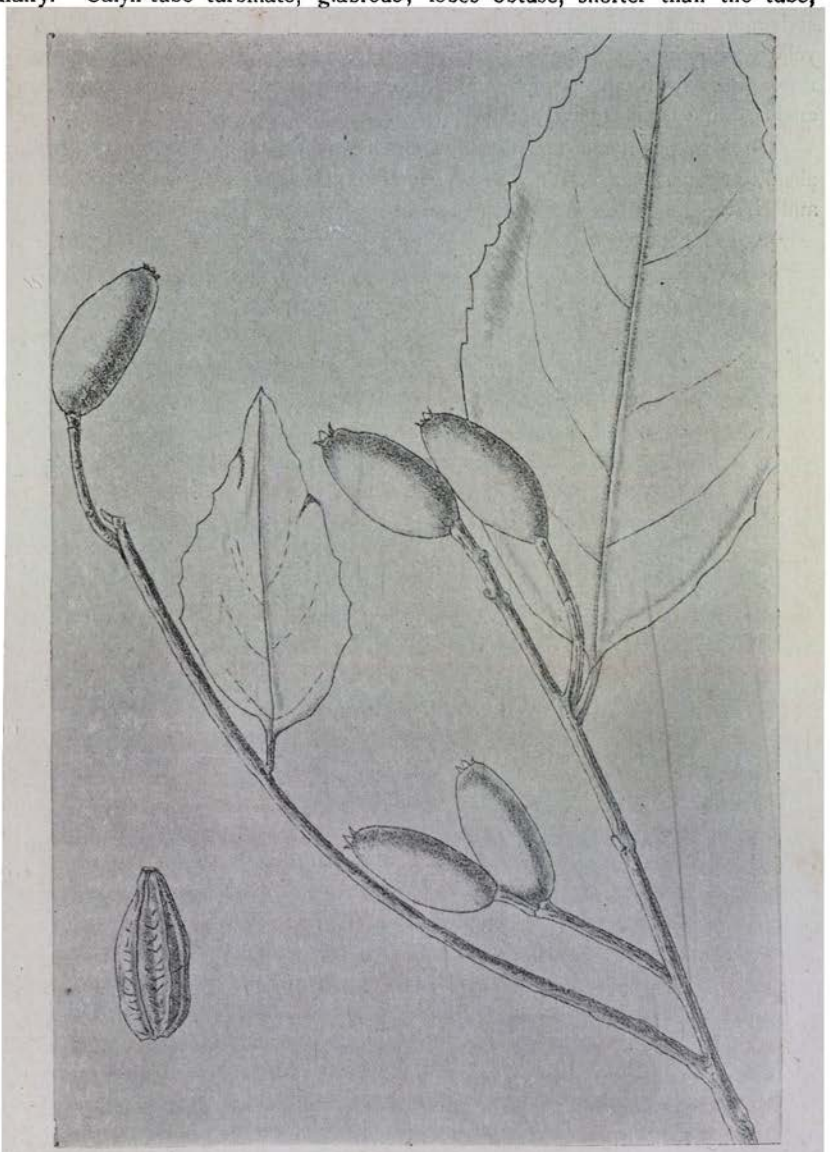

Fig 383. Symplocos kanarana, Talb.—*Fruit.*

glabrous or sparsely hairy at the apex. Corolla twice as long as the calyx, divided nearly to the base into 5 petals. Stamens about 40. Disk lobed, white-hairy; style more or less white-hairy; stigma obscurely lobed or capitate. Fruit cylindric, yellow, smooth, 1·25″ long by ·5″ thick; stone 1″ long, 1-3-celled, hard, rough, thick-walled, with 6 deep longitudinal furrows and sharp narrow ridges between, enclosed in a copious olive-green pulp.

N. Kanara, in rain-forest; Sircy and Siddapur, along the ghàts, closely allied to *S. macrocarpa,* Wgt. Mss. A rare species. Fl. C. and R. S. Fr. C. and H. S.

Order LVIII.—OLEACEÆ.

Erect or scandent shrubs or trees. Leaves opposite rarely alternate, trifoliate, pinnate or simple, exstipulate. Inflorescence in terminal or axillary, cymose panicles; flowers regular, usually bisexual, often dimorphic, bracteate. Calyx small, free, 4-9-toothed, lobed or truncate. Corolla gamopetalous, sometimes 5-12-lobed or petals distinct, usually 4. Stamens 2, inserted on the corolla; filaments usually short; anthers large. Ovary free, 2-celled; ovules 1-2 (rarely 3-4) in each cell; style simple; stigma simple or 2-lobed. Fruit succulent or dry. Seeds solitary or 2 in each cell; albumen fleshy, horny or O; embryo straight.

Corolla-lobes imbricate.

Scandent shrubs. Fruit a 2-lobed berry (1 lobe sometimes wanting) ... ... 1. Jasminum.

Small tree. Fruit a 2-celled, flat, chartaceous capsule ... ... 2. Nyctanthes.

A moderate-sized tree. Fruit a pear-shaped, woody, 2-valved capsule ... ... 3. Schrebera.

Corolla-lobes valvate or petals in distinct pairs or O.

Inflorescence axillary.

Petals 4, in distinct pairs ... ... 4. Linociera.

Corolla tubular or O ... ... 5. Olea.

Inflorescence in terminal panicles ... ... 6. Ligustrum.

1. JASMINUM, L.

Shrubs, usually scandent. Leaves simple, 3-foliate or unequally pinnate; petioles usually articulated. Inflorescence terminal, rarely axillary, cymose; flowers bracteate. Calyx 4-9-fid; tube funnel-shaped; lobes linear, long or short. Corolla-tube narrow; lobes 4-10, imbricate, spreading. Stamens 2, included in the corolla-tube; filaments short; anthers oblong; connective usually shortly produced. Ovary 2-celled; ovules 2 in each cell, basal, erect; style cylindric; stigma linear. Berry 2-lobed or entire by the failure of 1 carpel. Seeds usually 1 in each lobe, exalbuminous.

Leaves simple, opposite.

Calyx pubescent.

Calyx-teeth long.

Bracts small.			
Erect or suberect shrub	1.	J. Sambac.	
Scandent shrub	2.	J. malabaricum.	
Bracts large, leafy.			
Bracts green	3.	J. pubescens.	
Bracts white	4.	J. Rottlerianum.	
Calyx-teeth minute	5.	J. Roxburghianum.	
Calyx glabrous	6.	J. Ritchiei.	
Leaves trifoliate, opposite.			
Lateral-leaflets very small or O	7.	J. auriculatum.	
Lateral-leaflets large	8.	J. flexile.	
Leaves trifoliate or pinnate, alternate	9.	J. humile.	

1. J. Sambac, Ait. Hort. Kew 1, 8; Fl. Br. I. 3, 591; Dalz. & Gibs. Bomb. Fl. 137; Brandis For. Fl. 311; Cooke Fl. Pres. Bomb. 2, 111; Gamble Ind. Timb. 467. *The Arabian Jasmine. Mugra, bhut-mogra,* M.; *Mullige,* K.; *Mogro,* Guz.

A scandent or suberect shrub; branchlets pubescent. Leaves ovate, 1·25″-3·5″ by ·8″-2·5″, thin, glabrous, obtuse, acute, often apiculate at the apex, usually rounded at the base; lateral-nerves 4-6 pairs, prominent beneath and looping within the margin; petioles ·2″ long, pubescent. Flowers white, fragrant, solitary or in 3-7-flowered, terminal cymes; bracts linear-subulate, hairy; pedicels short or O. Calyx campanulate-tubular, ·5″ long; teeth 5-9, linear-subulate, longer than the tube. Corolla 1″ long; lobes oblong, acute or obtuse, as long as the tube. Berry of 1-2 globose lobes, each ·5″ in diameter, black, surrounded by the erect, subulate calyx-teeth.

Throughout India, Burmah and Ceylon, extensively cultivated in both hemispheres for its strongly fragrant flowers which in India are considered sacred to Vishnu; they are often made into garlands. Throughout the presidency in gardens, often in waste places near villages in North Kanara and the Konkan. I have never found it undoubtedly wild. Fl. throughout the year.

2. J. malabaricum, Wgt. Ic. t. 1250; Fl. Br I. 3, 594; Cooke Fl. Pres. Bomb. 2, 111; *J. arborescens,* var. *latifolium,* Talb. Trees Bomb. (1902) 216 (not of C. B. C.); *J. latifolium,* Grah. Cat. Bomb. Pl. 110; Dalz. & Gibs. Bomb. Fl. 138 (not of Roxb.) *Dolle-kusdi-balli, tirgal,* K.; *Kundi, kusar, kusuri,* M.; *Ranjai, jungly-chumbeli,* Vern.

A large climbing shrub; branchlets striate, glabrous. Leaves broadly ovate, 2″-4″ by 1·25″-2·25″, acute or acuminate at the apex, rounded or subcordate at

the base, membranous, glabrous; lateral-nerves about 8 pairs, the lower 2 nearly basal; petioles ·75″ long, jointed at about ·25″ from the base, glabrous. Flowers white, fragrant, in terminal, lax, many-flowered, trichotomous cymes; bracts linear-subulate, ·25″-1″ long, usually pubescent. Calyx ·5″ long with a campanulate tube and 5-7 linear, pubescent or glabrous teeth longer than the tube and often reflexed. Corolla about 1″ long, tubular, glabrous; lobes 6-10, about as long as the tube, lanceolate, finely acuminate. Berry of 1-2, ellipsoid lobes, each ·5″ long, black shining, surrounded by the erect or deflexed calyx-teeth; pedicels thickened upwards, about ·25″ long.

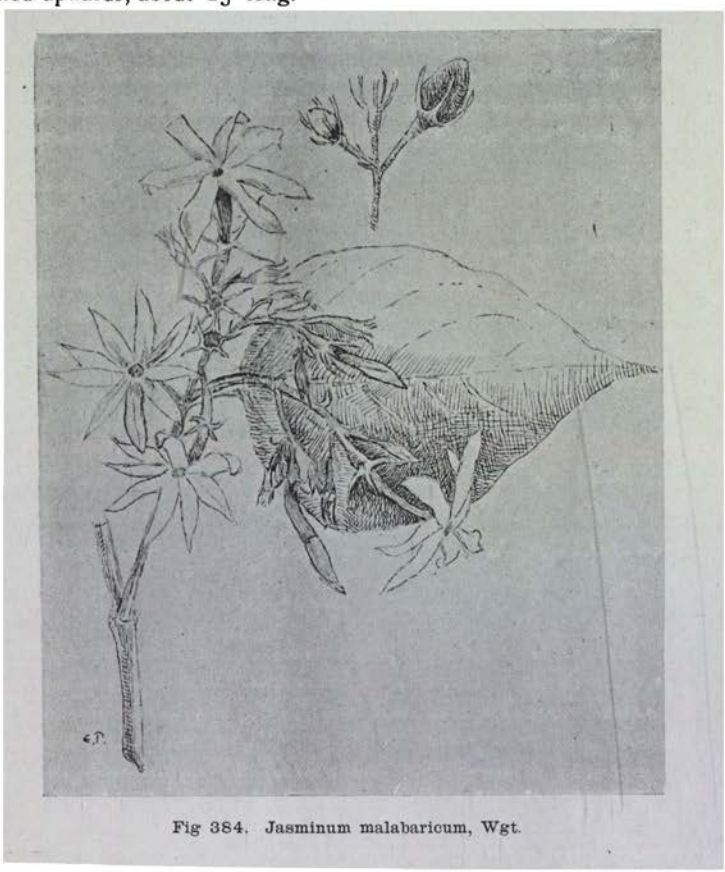

Fig 384. Jasminum malabaricum, Wgt.

Dr. Cooke in his Flora of the Bombay Presidency has restored its proper name to this common W. peninsular *Jasmine* so long considered to be identical with *J. arborescens*, Roxb. var. *latifolium*. The erronious naming was started by

Graham in his Catalogue of Bombay Plants and remained uncorrected until quite lately.

Western peninsula on the ghâts; throughout the presidency, very common and widely distributed in the moist monsoon-forests of the Konkan and North Kanara. Fl. Feb.-Mch. Fr. May-June. Stems unarmed, sometimes 8″ in diameter, often develop aerial roots. Bark grey, scaly; inner-bark light-brown. Wood grey, with a tinge of pink, smooth, moderately hard and firm with concentric narrow lines of white tissue (annual-rings?). Pores medium-sized and small, very numerous and equally distributed between the close, concentric lines. Medullary rays fine, short, numerous, indistinct.

3. J. pubescens, Willd. Sp. Pl. 1, 37; Fl. Br. I. 3, 592; Dalz. & Gibs. Bomb. Fl. 138; Cooke Fl. Pres. Bomb. 2, 112; Gamble Ind. Timb. 468; *J. hirsutum*, Brandis For. Fl. 312; *J. bracteatum*, Wgt.; Dalz. &. Gibs. Bomb. Fl. 138. *Kunda, ran-mogra*, Vern.

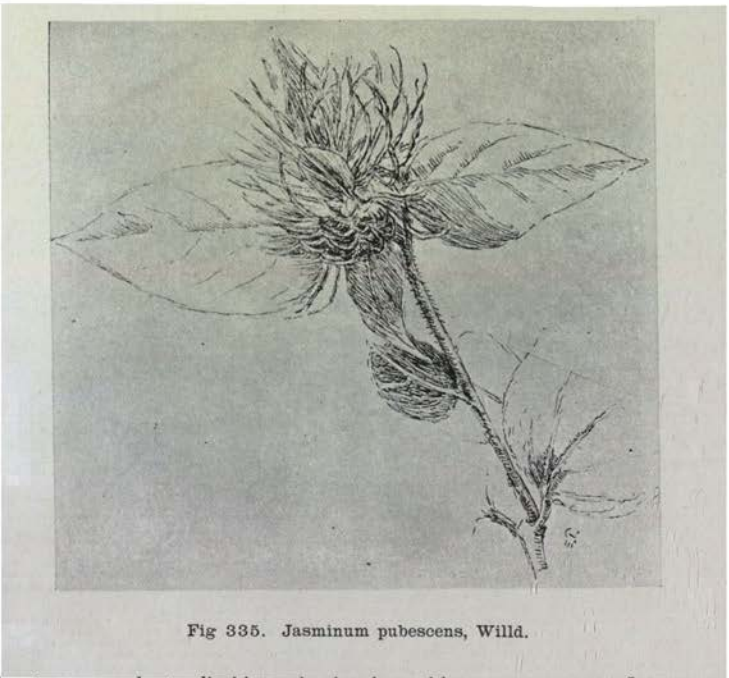

Fig 335. Jasminum pubescens, Willd.

A stout scandent climbing shrub; branchlets tomentose. Leaves ovate, 2″-3″ by 1·25″-1·75″, acute, often mucronate at the apex, rounded or subcordate at the base, thin, pubescent or brown-tomentose on both sides, at length glabrous above; lateral-nerves 4-6 pairs; petioles ·2″ long, brown-hairy. Flowers sessile,

white, in densely-flowered, terminal, cymose, brown-hairy heads shorter than the leaves; bracts large, green, leafy. Calyx-tube campanulate, ·25″ long, densely hairy; teeth 5-7, subulate, longer than the tube, fulvous-tomentose. Corolla glabrous; tube narrow, ·75″ long; lobes 6-8, ovate, acute, shorter than the tube. Berry-lobes 1-2, globose, ·25″ in diameter, black, surrounded by the erect, tomentose calyx-teeth.

Throughout India, up to 3000′, Burmah and China; common in the moist forests of North Kanara and the Konkan; often cultivated in gardens for its handsome, white, fragrant flowers. Fl. Dec.-Feb. Stems twisted. Bark very thin, light-brown. Wood white, moderately hard. Pores small, numerous. Medullary rays fine.

4. J. Rottlerianum, Wall. Cat. 2865; Fl. Br. I. 3, 593; Dalz. & Gibs. Bomb. Fl. 138; Cooke Fl. Pres. Bomb. 2, 112.

A climbing shrub with rufous-hairy branchlets. Leaves elliptic, 1·75″-4″ by 1·25″-1·75″, acute or acuminate at the apex, rounded or subcordate at the base, thin, pubescent on both sides, ultimately glabrescent above; lateral-nerves 4-6 pairs, looping within the margins and conspicuous beneath; petioles ·1″-·25″ long, densely hairy and jointed about the middle. Flowers white, solitary of fascicled at the ends of terminal peduncles; bracts conspicuous, white, unequal, ·4″-1″ long, lanceolate-acuminate, pubescent; pedicels about ·1″ long, stout, densely hairy. Calyx ·3″ long, hairy; tube short; teeth 5-9, subulate, ·25″ long. Corolla white, glabrous; tube about 1″ long; lobes 5-7, ·5″ long, oblong, obtuse. Berry 1-2-lobed, ovoid, ·25″-·4″ long, black, surrounded by the bracts and calyx-teeth.

Western peninsula from the Konkan to Travancore 2-5000′; common in the rain-forest of North Kanara and the Konkan. Fl. Jan.-Mch. Fr. June-Aug.

5 J. Roxburghianum, Wall. Cat. 2870; Fl. Br. I. 3, 595; Cooke Fl. Pres. Bomb. 2, 113.

A climbing shrub; branchlets etc. densely tomentose. Leaves broadly ovate, 2″-4″ by 2″-3″, acute or shortly acuminate at the apex, rounded or shallow-cordate at the base, thin, brown-tomentose on both sides, at length glabrescent above; lateral-nerves about 6 pairs, lower 2 pairs basal, distinct on the under side; petioles ·25″-·5″ long, grey-tomentose. Flowers white, in large, terminal, bracteate, open, corymbose, many-flowered cymes; bracts linear-lanceolate, acute, acuminate or subulate, tomentose; pedicels ·2″ long. Calyx-teeth linear, ·15″ long, villous. Corolla glabrous; tube ·3″ long; lobes 5-7, linear-acute, ·5″ long. Berry usually 1-lobed, ·25″ long, obovoid, sometimes slightly oblique, black, much exceeding the short calyx-teeth.

Mahableshwar ghâts and Bababuden hills of Mysore; deciduous forests of North Kanara near Sambrani, Haliyal taluka; also collected on the banks of the Kala-nuddi by Ritchie. A rare species in the Bombay presidency.

6. J. Ritchiei, Clarke, Fl. Br. I. 598; Cooke Fl. Pres. Bomb. 2, 113.

A climbing shrub nearly glabrous throughout; branches smooth, black, shining. Leaves elliptic, 2″-4·5″ by ·75″-2,″ acute or acuminate at the apex, acute at the base, membranous; lateral-nerves about 5 pairs, dark-coloured, looping within the margin, sometimes hairy in the axils; petioles ·25″ long. Flowers white, in lax, terminal, 6-9-flowered cymes; pedicels filiform, about 1″ long, slightly thickened upwards; bracts subulate, filiform. Calyx about ·25″ long; tube sometimes ribbed; teeth linear, as long as the tube. Corolla white, glabrous, linear-acute and usually curved in bud, about 1″ long; lobes linear-acute, shorter than the slender tube. Berry 1-2-lobed; lobes spherical, ·25″ in diameter, black-shining; pedicels long, slender, thickened at the top.

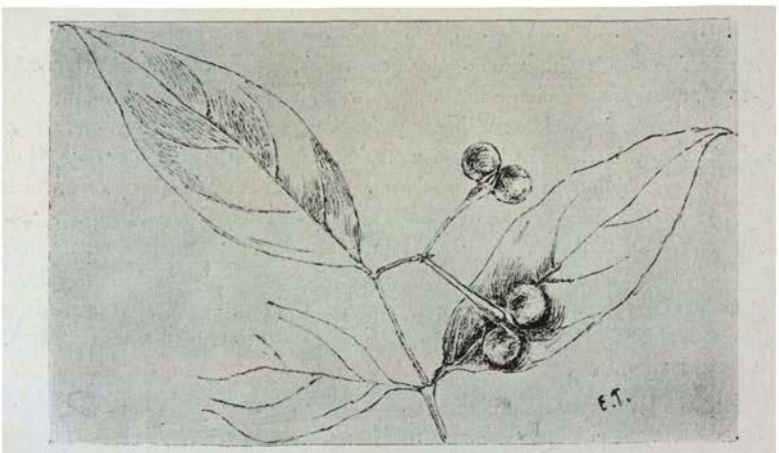

Fig 386. Jasminum Ritchiei, C. B. Clarke.

Western peninsula from the Konkan southwards, ascending to 5000′ on the Bababuden hills; in the rain-forests of the Konkan and North Kanara ghâts from Ainshi southwards, common, apparently endemic. Fl. Aug-Sept. Fr. Dec.-Jan.

7. J. auriculatum, Vahl. Symb. Bot. III, 1; Fl. Br. I. 3, 600; Cooke Fl. Pres. Bomb. 2, 113; Trimen Fl. Ceylon 3, 115; *J. affine,* and *J. ovalifolium,* Wgt. Ic. tt. 1255, 1256. *Jai,* Vern. *Dongarke-chumbeli,* H.

A scandent, villous, pubescent or glabrous, often an erect bushy shrub; branchlets terete, usually more or less villous. Leaves broadly ovate, sometimes accompanied by 2 minute, auricular leaflets, ·5″-1·5″ by ·4″-1,″ obtuse, acute, acuminate, emarginate or sometimes mucronate at the apex, usually rounded at

the base, subcoriaceous, more or less grey-villous, sometimes glabrous on both sides; lateral-nerves 3-4 pairs, indistinct; petioles ·1″ long, hairy. Flowers white, in terminal, compound, lax, corymbose cymes, usually with grey-pubescent branches; bracts lanceolate, acute; bracteoles subulate. Calyx ·1″ long; tube ribbed; teeth 5, short, triangular, obtuse. Corolla white; tube ·25″-·5″ long; lobes half the length of the tube, ovate, acute. Berries black, globose, ·2″ in diameter.

Dry parts of the Deccan peninsula and Ceylon, common; throughout the deciduous forests of the presidency, often in hedges, absent from the Konkan and North Kanara; cultivated in Sind. Fl. Aug.-Sept. Fr. Dec.-Feb.

8. J. flexile, Vahl. Symb. Bot. III, 1; Fl. Br. I. 3, 601; Cooke Fl. Pres. Bomb. 2, 114, Trimen Fl. Ceyl. 3, 115.

A large climbing, glabrous shrub; branchlets smooth, lenticellate. Leaves opposite, mostly trifoliate; petioles 1″-1·25″ long; leaflets ovate; terminal 2·5″-4·5″ by 1″-2,″ acuminate at the apex, rounded or subacute at the base, thin or subcoriaceous, glabrous, shining above, paler beneath; lateral-nerves about 6 pairs uniting within the margin; lowest pair basal, all inconspicuous or distinct; lateral-leaflets similar and slightly smaller than the terminal, often oblique at the base; petiolules channelled, terminal 1″ long, lateral ·5″ long. Flowers white, in terminal or axillary, lax, few or many-flowered, panicled cymes, usually longer than the leaves; bracts small, linear, acute; pedicels 0-·5″ long, slender. Calyx ·1″ long, campanulate; teeth minute, triangular, acute. Corolla glabrous; tube 1″ long; lobes elliptic, obtuse, half as long as the tube. Berry ellipsoid, black, size of a small olive.

Deccan peninsula and Ceylon; in rain-forest on the southern ghâts of North Kanara, common. Fl. Nov.-Jany. A large and extensive climber with handsome flowers.

9. J. humile, Linn.; DC. Prodr. VIII, 313; Fl. Br. I. 3, 602; *J. revolutum,* Brandis For. Fl. 313. *Hemapupika,* Vern.

Indigenous in Kashmir, the N. W. Himalayas, Nilgiris and Ceylon; absent from the Bombay presidency; commonly cultivated in gardens. An erect shrub with angular branchlets.

2. NYCTANTHES, Linn.

A small tree. Leaves opposite, scabrous. Flowers sessile, bracteate, in fascicles of three, disposed in terminal, trichotomous cymes. Calyx sub-truncate; teeth inconspicuous. Corolla-tube cylindrical, orange; lobes 5-8, white, spreading, contorted in bud. Anthers 2 near the mouth of the corolla-tube. Ovary 2-celled; ovule 1 in each cell, erect. Capsule flat, splitting into 2, subdiscoid

carpels. Seed erect, orbicular, flattened; testa thin; albumen O; cotyledons flat; radicle inferior.

N. Arbor-tristis, Linn.; Roxb. Fl. Ind. 1, 86; Fl. Br. I. 3, 603; Bedd. Fl. Sylv. t. 240; Brandis For. Fl. 314; Dalz. & Gibs. Bomb. Fl. Suppl. 51; Cooke Fl. Pres. Bomb. 2, 115; Gamble Ind. Timb. 469. *Sephali*, Sans.; *Hursing*, K.; *Parijtak*, M. *Har, singahar, shiuli*, Vern.

Fig 387. Nyctanthes Arbor-tristis, Linn.

A large shrub or small tree; branchlets quadrangular, strigose. Leaves broadly ovate, 2″-4″ by ·75″-2·25″, acute or bluntly acuminate at the apex, rounded or cuneate at the base, entire or distantly toothed, coriaceous, dark-green and scabrous above with bulbous white hairs, paler and tomentose beneath; lateral-nerves 4 pairs, inarching; petioles ·3″ long, hairy, not articulate. Flowers sweetly-scented, sessile, in axillary, peduncled, 3-5-flowered, bracteate heads and

terminal, short, trichotomous cymes; peduncles 1″-2″ long, slender, hairy; bracts elliptic, ·25″-·5″ across, acute, hairy. Calyx shortly campanulate, ·25″ long, nearly truncate, hairy. Corolla glabrous, about ·6″ long; tube ·25″ long, orange-coloured; lobes white, elliptic, ·25″ broad. Capsule 2-seeded, orbicular or obcordate, ·75″ in diameter by ·2″ thick, compressed, glabrous, longitudinally and reticulately veined.

Indigenous in the sub-Himalayan and Terai tracts, Central India, Burmah and Ceylon ; cultivated in gardens throughout the presidency. Fl. throughout the year. A large shrub or small tree. Bark thick, rough, light-brown coloured. Wood brown, close-grained, splits when drying; furnishes a useful fuel. The flowers open during the night and fall off the tree in the early morning, hence probably the specific name "*Arbor-tristis*"; they yield an orange dye used for colouring Tussah-silk and are made into garlands in Ceylon. The rough leaves serve for polishing wood like sandpaper.

3. SCHREBERA, Roxb.

A deciduous tree. Leaves opposite, imparipinnate; leaflets 3-4-pairs. Flowers in trichotomous, terminal cymes. Calyx 4-7-lobed. Corolla hypocrateriform; tube cylindric; lobes 5-7, patent, imbricate in bud. Stamens 2, inserted near the mouth of the corolla-tube. Ovary 2-celled; 3-4 ovules in each cell pendulous from its apex; stigma bifid. Fruit a pear-shaped, thick, woody, 2-valved capsule, loculicidally dehiscent. Seeds 8, pendulous, winged ; albumen O; cotyledons plano-convex or contorted; radicle superior.

S. swietenioides, Roxb. Fl. Ind. Ed. Carey & Wall. 109; Fl. Br. I. 3, 604; Bedd. Fl. Sylv. t. 248; Brandis For. Fl. 305; Dalz. & Gibs. Bomb. Fl. 138; Cooke Fl. Pres. Bomb. 2, 116; Gamble Ind. Timb. 469. *Moka, mokari,* Vern.; *Popti, ghant*, Guz.; *Natki-mokha*, Bhil.

A medium-sized tree; branchlets rough, lenticellate. Leaves opposite, 9″-12″ long; petioles 2″-3″ long; leaflets 5-9, ovate, 2″-4″ by 1″-2,″ acute or shortly acuminate at the apex, often unequal-sided and acute at the base, coriaceous, pubescent, ultimately glabrous; lateral-nerves 6-8 pairs, conspicuous beneath; venation reticulate; petiolules articulate at the base, terminal 1″-2″, lateral ·5″ long. Flowers white or brown, fragrant at night, in terminal, trichotomous, many-flowered cymes 3″-6″ long. Calyx campanulate, pubescent, ·15″ long, truncate or more or less obscurely toothed, sometimes splitting into 2 lips. Corolla-tube ·25″ long; lobes ovate, obtuse, as long as the tube, dotted on the inside with glandular brown spots and glandular-ciliate on the margins. Capsule 2″ long, seated on the rough, truncate, enlarged, bell-shaped calyx, pendulous, rough with white raised dots; seeds 3-4 in each cell.

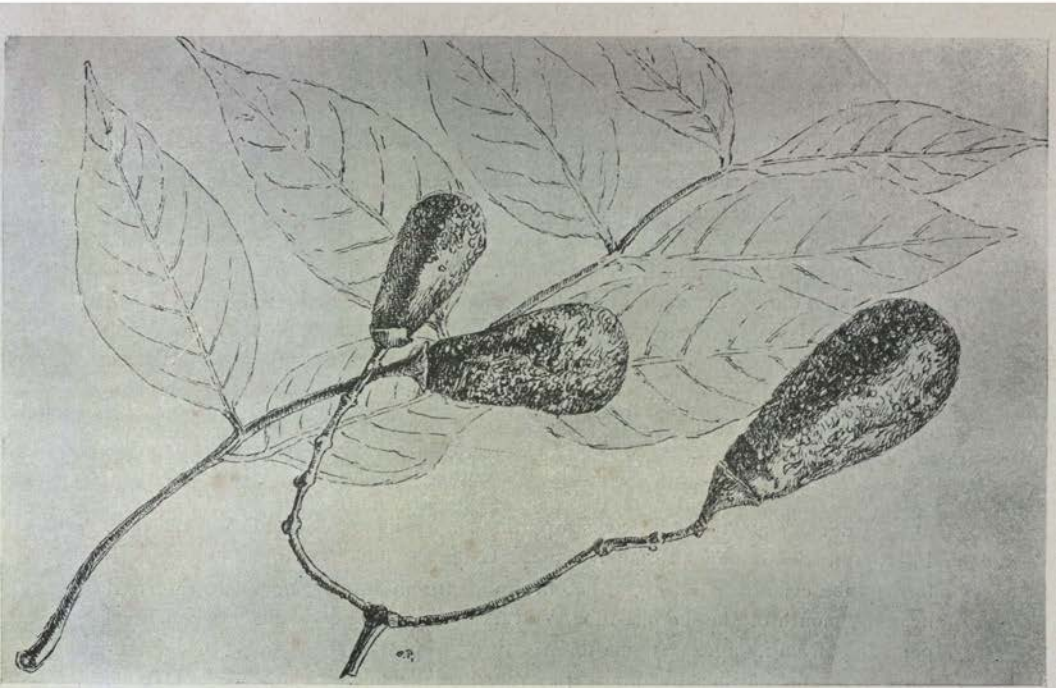

Fig 388. Schrebera swietenioides, Roxb.—*Fruit.*

Kumaun, Burmah, Central, Southern and Western India; throughout the presidency in deciduous monsoon-forests, locally common in North Kanara. Fl. Apl.-May. Fr. ripe next cold season. A moderate-sized tree, 40′-50′high. Bark grey, thin, scaly, scabrous. Wood hard, purplish-brown, veined, durable, with irregular masses of dark-coloured wood in the centre. Pores small, often in radial groups. Medullary rays fine, uniform, at equal distances apart. Weighs 50 lbs. to the cub. ft. Used for turning.

4. LINOCIERA, Swartz.

Shrubs or trees. Leaves opposite, entire. Flowers in axillary panicles or cymes, sometimes in small, terminal fascicles. Calyx small, 4-fid. Petals 4, often cohering in pairs. Stamens 2; anthers dehiscing on the margins. Ovary 2-celled; ovules 2 in each cell, pendulous from its apex; style short; stigma obscurely bifid or entire. Fruit an ellipsoid drupe, usually 1-seeded. Seed pendulous; testa thin; albumen fleshy or O; radicle superior.

Flowers in small, few-flowered, pedunculate fascicles.
Seeds albuminous ... ... 1. L. malabarica.
Flowers in lax, many-flowered panicles. Seeds
exalbuminous .... 2. L. intermedia.

1. L. malabarica, Wall. Cat. 2828; Fl. Br. I. 3, 607; Dalz. & Gibs. Bomb. Fl. 159; Cooke Fl. Pres. Bomb. 2, 117; Gamble Ind. Timb. 473; *Chionanthus malabarica*, Bedd. Fl. Sylv. t. 239. *Akerkal, kunta-akerkal, yellum, lavanty, maniki-mara*, K.

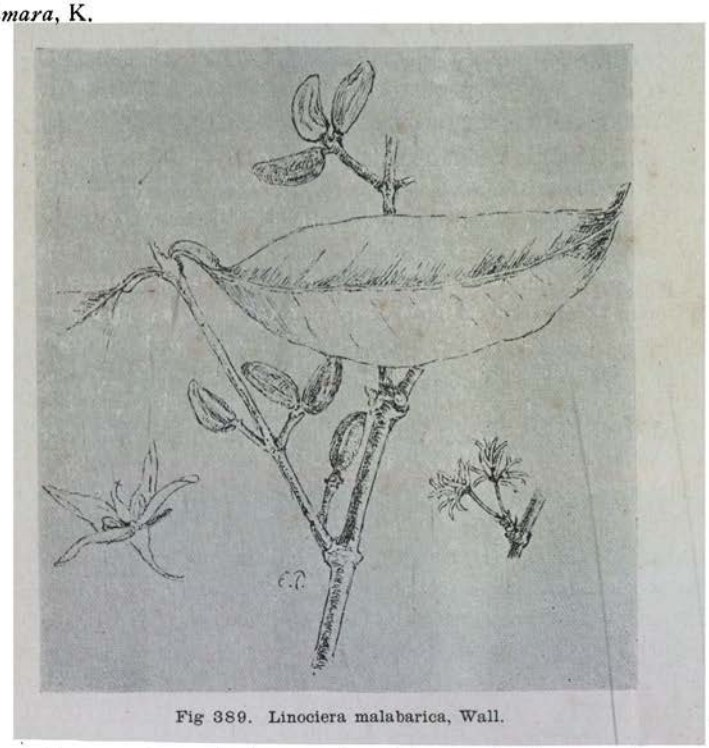

Fig 389. Linociera malabarica, Wall.

A small or moderate-sized, tree; branchlets lenticellate, rough. Leaves opposite, entire, elliptic or obovate, 2″-4″ by 1″-1·75″, acute or shortly acuminate at the apex, narrowed or cuneate at the base, coriaceous, glabrous; lateral-nerves numerous, parallel, inconspicuous; petioles ·25″-·5″ long, channelled above, rugose, shining. Flowers small, white, smelling strongly like ripe apples, 1-6-fascicled or in congested racemes on slender, bracteate, axillary or terminal, fascicled peduncles; bracts small, hairy or tomentose; peduncles ·5″-·75″ long, white-hairy; pedicels 0-·1″ long, hairy. Calyx white-hairy, ·08″ long; lobes minute, acute.

Corolla white, ·25″ long; lobes 4, linear-lanceolate, connate in pairs at the base. Anthers sessile, one at the base of each pair of petals. Ovary hairy; style very short, bifid. Drupe ellipsoid, ·3″ long, slightly curved, black, succulent when ripe; endocarp crustaceous, curved and 4-ribbed; albumen copious, fleshy.

Deccan peninsula; throughout the rain-forests of the Konkan and North Kanara. Fl. Nov.-Jan. Fr. Feb.-June. A small tree. Bark grey, smooth, shining covered with raised corky dots; inner-bark ·5″ thick, white with yellow fibres, quickly turns dark-coloured on exposure. Wood reddish-grey, hard, compact, smooth. Annual-rings indistinct. Pores small, numerous, often in lines or small irregular groups. Medullary rays fine, reddish, short, distinct. Weighs about 52 lbs. to the cub. ft.; somewhat resembles *Boxwood*. Flowers have a strong odour like ripe apples in the early morning.

2. L. intermedia, var. **Roxburghii,** C. B. C. in Fl. Br. I. 3, 609; Cooke Fl. Pres. Bomb. 2, 117; Gamble Ind. Timb. 473; *Olea Roxburghiana*, Dalz. & Gibs. Bomb. Fl. 159; *Chionanthus intermedia,* Bedd. Fl. Sylv. t. 239.

A small tree; branchlets rough, lenticellate. Leaves elliptic, 3″-4·5″ by 1·25″-2·25″, acute or acuminate at the apex, acute or cuneate at the base, thinly coriaceous, glabrous; lateral-nerves 8-10 pairs, distinct beneath; petioles ·5″-·75″ long, narrowly winged in the upper half. Flowers small, white, ·15″ long in spreading, compound, bracteate, branched panicles about 2·5″ long; panicle-branches flattened; bracts lanceolate, glabrous; pedicels ·05″-·1″ long. Calyx minute; lobes acute. Corolla ·1″ long; lobes 4, very shortly united at the base and sometimes arranged obscurely in pairs. Anthers sessile. Ovary glabrous; style bifid with divaricate branches. Drupe ovoid about ·5″ long, purple-black; seed exalbuminous.

Orissa and the Circars, Chota Nagpore, Western peninsula on the Konkan ghâts. Anamallays, and the Nilgiris up to 6000′. A rare tree in the Bombay presidency not common as stated by Dalzell. Wood white, moderately-hard and close-grained, similar in structure to that of *L. malabarica*.

5. OLEA, Linn.

Trees or shrubs. Leaves opposite, entire or toothed. Flowers small, in axillary or terminal panicles, often diœcious; bracts minute. Calyx 4-toothed or lobed. Corolla-tube short; lobes 4, induplicate-valvate or O. Stamens 2. Ovary 2-celled; ovules 2 in each cell, laterally attached or subpendulous; style short; stigma capitate or bifid. Drupe ellipsoid or globose, 1-seeded. Seed pendulous; albumen fleshy; radicle superior.

0. dioica, Roxb. Fl. Ind. Ed. Carey & Wall. 1, 105; Fl. Br. I. 3, 612; Dalz. & Gibs. Bomb. Fl. 159; Bedd. Fl. Sylv. 154; Cooke Fl. Pres. Bomb. 2,

118; Gamble Ind. Timb. 475. *Indian Olive. Par-jamb, karamba*, Vern.; *Hejje-akerkal, akki*, K.; *Lauki*, M.

A moderate-sized or large tree; branchlets lenticellate, smooth shining. Leaves elliptic-lanceolate, 3″-6″ by 1·25″-2″, acute or acuminate at the apex, narrowed into the petiole at the base, coriaceous, glabrous, distantly and sharply serrate; lateral-nerves 8-10 pairs, usually somewhat inconspicuous; petioles ·25″-·5″ long. Flowers white, small, polygamo-diœcious, in axillary or extra-axillary, compound panicles, 1″-3″ long; panicle-branches slender, articulate. Male fl.: Calyx minute, glabrous; lobes triangular. Corolla ·1″ long, sometimes wanting or caducous in the hermaphrodite flower; lobes shorter than the tube, triangular, obtuse. Anthers large on short filaments. Hermaph. fl.: Calyx and corolla of the male. Stamens 2-3, inserted on the corolla-tube or epigynous. Ovary glabrous. Drupe ellipsoid, about ·5″ long, black, covered with a dry, powdery bloom when ripe; seed ellipsoid, rugose, bitter; cotyledons elliptic, flat.

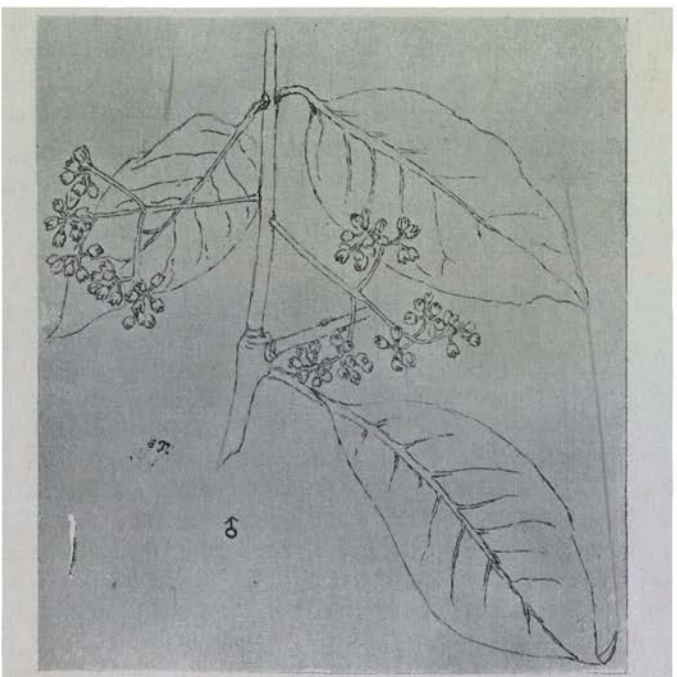

Fig 390. Olea dioica, Roxb.

Lower hills in Assam and Bengal, throughout the Deccan peninsula, evergreen monsoon and rain-forests of the Konkan and North Kanara ghâts,

common. Fl. Feb.-Apl. Fr. R. S. A small or moderate-sized tree. Bark ·5″ thick, grey, smooth outside, yellow and fibrous within. The heartwood of old trees is dark yellowish-brown, streaked and mottled, hard and shining. Pores small, numerous, simple or divided or arranged in oblique lines enclosed in pale tissue. Medullary rays fine, numerous, wavy, crossed by concentric wavy lines of light-coloured tissue at unequal distances. Weighs about 54 lbs. to the cub. ft. A sweet-scented wood when freshly cut and called in consequence in N. Kanara *Pun-neerl-gund*, or *Rose Sandalwood*; adapted for carving and cabinet work. The sapwood is reddish-grey in colour, hard and smooth, and weighs nearly as much as the heartwood.

6. LIGUSTRUM, Linn.

Shrubs or small trees. Leaves opposite, entire. Flowers small, white, bisexual, in terminal, trichotomous panicles, sometimes with foliaceous bracts in the lower part. Calyx small, truncate or 4-toothed. Corolla funnel-shaped, 4-lobed. Stamens 2 on the corolla-tube; anthers included or exserted. Ovary 2-celled with 2 ovules in each cell; style long; stigma subclavate, hardly 2-fid. Fruit a 2-4-seeded berry. Seeds albuminous; cotyledons flat; radicle short, superior.

L. neilgherrense, Wgt. Ic. t. 1243; Fl. Br. I. 3, 615; Dalz. & Gibs. Bomb. Fl. 159; Cooke Fl. Pres. Bomb. 2, 119; Gamble Ind. Timb. 475; *L. robustum,* Bedd. Fl. Sylv. 153; Brandis For. Fl. 310. *Kungin, medsing,* M.

A large shrub or small tree; branchlets rough with numerous white lenticels. Leaves elliptic or obovate, 1·25″-3″, by ·75″-2″, acute, shortly acuminate, often mucronate at the apex, acute at the base, coriaceous, glabrous, black-dotted beneath; lateral-nerves 5-8 pairs, slender, conspicuous beneath; petioles ·25″ long, channelled and sometimes winged. Flowers white, sweetly-scented, in terminal. spreading or compact, bracteate panicles; panicle-branches opposite, obtusely quadrangular, lenticellate; bracts lanceolate, leafy at the base of the lowest pair of the panicle-branches, smaller upwards; bracteoles linear-subulate; pedicels 0-·1″ long. Calyx campanulate, ·1″ long, truncate or obscurely lobed. Corolla ·25″ long; lobes as long as the tube, acute, reflexed. Anthers large, exserted in the open flower. Style ·1″ long; stigma bifid. Berry obovoid, ·25″ by ·2″, black, covered with a powdery bloom when ripe.

Western peninsula on the ghâts from Bombay southwards; higher hills of the Konkan and North Kanara in moist monsoon-forest near the Tinai ghât, very common on the Mahableshwar plateau. Fl. Aug.-Nov. Fr. ripe January. A large shrub or small tree. Bark rough and warty. Wood grey, hard, compact, smooth, sometimes with a dark-coloured centre. Annual-rings very ditinctly marked by a narrow line of small pores enclosed in soft, white tissue. Pores

small, rough or in lines between the numerous distinct, fine medullary rays; weighs about 52 lbs. to the cub. ft. Used in the construction of huts and for fuel at Mahableshwar.

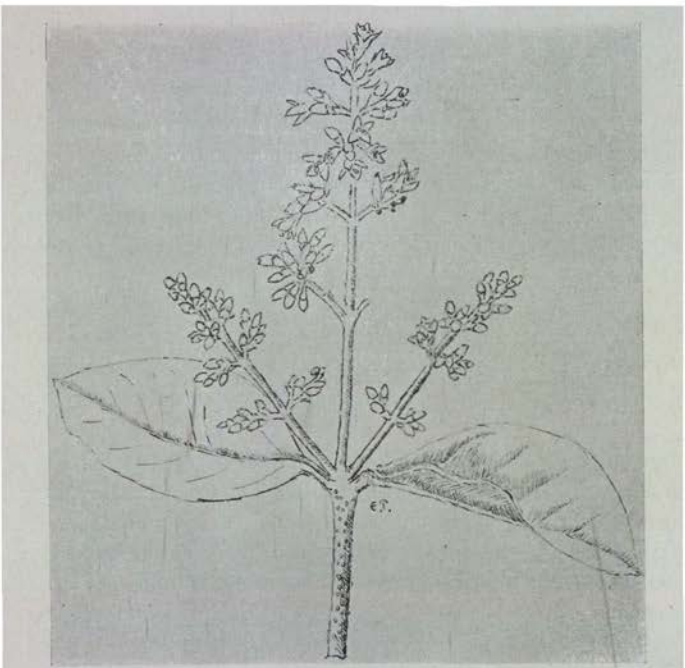

Fig 391. Ligustrum neilgherrense, Wght.

Order LIX.—SALVADORACEÆ.

Glabrous trees or shrubs, unarmed or spinous. Leaves opposite, entire. Flowers small, regular, tetramerous, clustered or panicled, diœcious or polygamo-dimorphic. Calyx free, 3-5-fid. Corolla shortly campanulate or petals free, 4-merous, imbricate in bud. Stamens 4; filaments free or connate into a tube, slightly flattened. Ovary free, 1-2 or imperfectly 4-celled; ovules 1-2 in each cell, erect from the base; style short; stigma 2-fid or subentire. Drupe mostly 1-seeded; seed erect, exalbuminous; embryo with fleshy, plano-convex cotyledons.

Unarmed shrubs or trees. Corolla gamopetalous ...	1. Salvadora
Spinous shrubs. Petals 4, distinct	2. Azima

1. SALVADORA, Linn.

Evergreen shrubs or trees. Leaves opposite, exstipulate, entire. Flowers hermaphrodite or (mostly) functionally unisexual, in terminal or axillary panicles; bracts minute. Calyx 4-lobed; lobes imbricate. Corolla-tube short; lobes 4. Stamens 4, alternating with the corolla-lobes. Ovary 1-celled; ovule 1, erect, basal; style O. Drupe globose, supported by the slightly enlarged calyx. Seed erect, exalbuminous.

Leaves ovate. Panicles lax, compound. Drupes red	1. S. persica.
Leaves lanceolate. Panicles reduced to axillary clustered spikes. Drupes yellow	2. S. oleoides.

1. S. persica, Linn.; A. DC. Prodr. XVII, 28; Fl. Br. I. 3, 619; Dalz. & Gibs. Bomb. Fl. 312; Brandis For. Fl. 315; Cooke Fl. Pres. Bomb. 2, 121; Gamble Ind. Timb. 476; *S. Wightiana,* Bedd. Fl. Sylv. t. 247. *Mustard Tree of Scripture*; *Toothbrush Tree. Khabbar, pilu,* Sind.; *Khakhin,* M.

Usually a small tree; branches numerous, drooping, striate, glabrous. Leaves ovate or elliptic, 1·75″-3″ by 1″-2″, obtuse, acute or acuminate, often mucronate at the apex, rounded at the base, thick, glabrous, glaucous-green; lateral-nerves 5-6 pairs arching upwards, obscure; petioles ·5″-·75″ long. Flowers greenish-yellow, ·1″ across, numerous, on opposite, spreading peduncles shorter or longer than the leaves, forming open, leafy, terminal or axillary panicles; pedicels ·12″ long; bracts small ovate, very caducous. Calyx divided halfway down; lobes

·05″ long, rounded, persistent in fruit. Corolla deeply divided also persistent in fruit; lobes ·1″ long, thin, ovate, obtuse or toothed at the apex, reflexed. Stamens exserted beyond the reflexed corolla-lobes. Drupe globose, ·12″ in diameter, smooth, red.

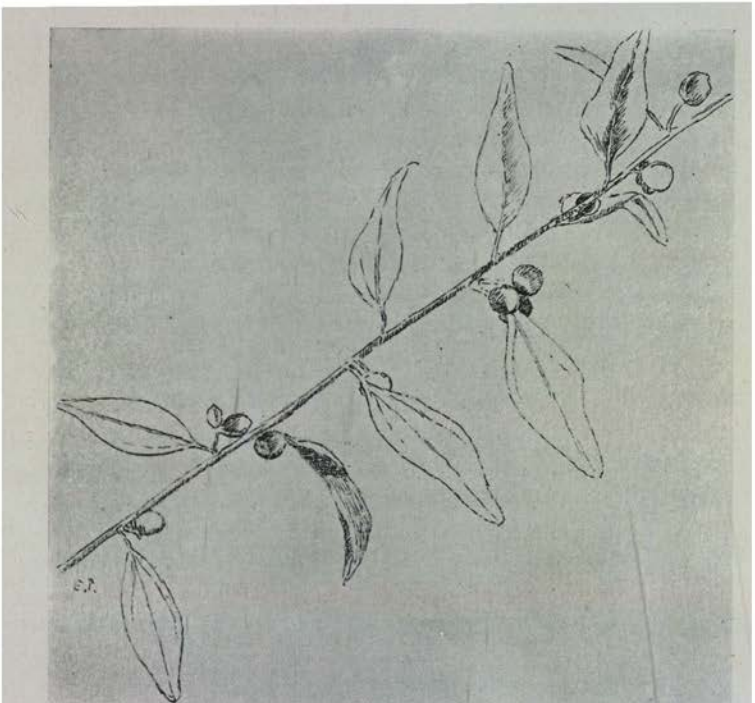

Fig 392. Salvadora persica, Linn.

In the drier climates of India from the Punjab and Sind to Patna, Circars and North Ceylon; dry districts of the presidency and Sind often on saline soils; on the bunds of tanks and in open places near villages in the black soil country, also found near the coasts of Guzerat, the Konkan and North Kanara in littoral forests; sometimes planted in Mahomedan cemeteries. N. Kanara sea coast growing above high water mark in thickets containing *Clerodendron inerme, Zizyphus Œnoplia*, and *Z. Jujuba, Argyreia* sp., *Canavalia* sp., *Derris uliginosa*, etc. Fl. Nov.-May. Fr. Jan.-June. A small, evergreen tree with thin, grey bark. Under favorable conditions the short fluted stem sometimes reaches 2′ in diameter at the base. Wood white and soft. Pores small, in short radial lines, enclosed in oval patches of soft tissue. Numerous concentric bands of

soft tissue between broader bands of firm tissue are distinctly visible. Medullary rays fine, numerous, distinct. Weighs 45 lbs. to the cub. ft. Easy to work; much employed in the manufacture of native tooth-brushes. The root-bark is very acrid. The young branches and leaves are a favorite fodder of camels in Sind. The fruit is used medicinally.

2. S. oleoides, Dcne. in Jacq. Voy. Bot. 140, t. 144; Fl Br. I. 3, 620; Brandis For. Fl. 316. t. 39; Cooke Fl. Pres. Bomb. 2, 121; Gamble Ind. Timb. 477; *S. Stocksii*, Wgt. Ill. 2, 229. *Khabbar*, *diar*, Sind.; *Kinkanela*, *pilu*, M.; *Khakananutela*, Guz.; *Jhal*, Hind.

A small tree, usually a large, stiff-branched shrub; branches grey, divergent, glabrous. Leaves lanceolate, 1·5″-3″ by ·15″-·35″, acute at the apex and base, often mucronate at the apex, coriaceous, fleshy; nervation obscure; petioles about ·25″ long. Flowers greenish-white, ·1″ across, in axillary, panicled spikes, often in short clusters. Calyx cup-shaped, divided to below the middle, persistent in fruit; lobes ovate-obtuse, membranous on the margins. Corolla deeply divided, slightly exceeding the calyx; lobes ovate-obtuse, membranous, persistent. Berry globose or ovoid, ·2″ in diameter, yellow when ripe, supported by the persistent calyx and corolla.

Punjab and Rajputana in the desert regions. In the dry deserts of Sind on arid and saline soils, associated with *S. persica* and often the principal constituent of the desert flora over large areas. Fl. Mch.-April. Fr. June. A large evergreen shrub or small tree, sometimes up to 14′ in circumference. Bark grey, tessellated. Wood light-red, moderately-hard, with a small, irregular shaped, purple heartwood; used for building purposes, agricultural implements, &c. Makes a bad fuel. Seeds yield a green oil employed in native medicine. Fruit sweet, edible, when dried is sold in large quantities in the Sind bazars. The branches and leaves serve as camel-fodder but other animals will not eat them.

2. AZIMA, Lamk.

Spinous, rambling shrubs. Leaves opposite, entire. Flowers small, axillary, dicœcious; bracts 0 or leaflike; bracteoles linear, small. Calyx campanulate, 2-4-divided. Petals 4, imbricate in bud. Stamens 4, alternate with the petals. Ovary 2-celled; ovules 1-2 in each cell, erect; stigma large, 2-fid. Berry globose, 1-2-seeded. Seeds globose, exalbuminous.

A. tetracantha, Lamk. Dict. 1, 343; Fl. Br. I. 3, 620; Dalz. & Gibs. Bomb. Fl. 143; Cooke Fl. Pres. Bomb. 2, 122; Gamble Ind. Timb. 478. *Kantagurkamai*, H.

A spinous, straggling or bushy shrub; branches obtusely 4-angled, green, rigid, pubescent when young, afterwards glabrescent. Leaves ovate, 1″-2·5″ by

·3″-1″, spinous at the apex, acute at the base, thick, rigid, pale, glabrous shining; lateral-nerves distinct, 3-4 pairs, arching upwards from the base; petioles ·12″ long; stipular-spines divaricate, ·5″-1·5″ long, 4 at each node. Flowers sessile, greenish-white, in crowded, axillary fascicles along the branches; bracts leafy, spine-tipped, in the upper fascicles obsolete. Male fl. numerous, in crowded fascicles, arranged in interrupted, axillary spikes 1″-4″ long in the male and reduced to one or two flowers in the female. Male fl.: Calyx ·1″ long, shortly divided, pubescent; lobes ovate, acute, ·05″ long. Petals slightly exceeding the calyx-lobes, linear, lanceolate, acute, spreading, ciliolate on the margins Female fl.: Calyx pubescent; lobes ·12″ long, ovate-apiculate, usually reduced to 2. Petals similar to those of the male. Ovary 2-celled, glabrous; ovules usually solitary in each cell; stigma 2-lobed. Drupe globose, white, ·25″ in diameter, 1-2-seeded.

Deccan peninsula, Coromandel coast and Ceylon; common throughout the dry districts of the presidency. Fl. Dec.-Mch. Fr. H. S. Makes strong, excellent hedges. The leaves and bark are employed in native medicine. Fruit white, edible.

Dobera Roxburghii, Planch. in Ann. Sc. Nat. ser. 3, X, 191; Fl. Br. I. 3, 619; Cooke Fl. Pres. Bomb. 2, 123; *Blackburnia monadelpha*, Roxb. Fl. Ind. 1, 415. A glabrous tree. Leaves elliptic-acute, coriaceous. Flowers polygamo-diœcious, clustered on the branches of an axillary inflorescence, trichotomous in the male flowers, subsessile in the female. Calyx-3-5 toothed. Petals 4-5, free, imbricate. Stamens 4-5; filaments connate into a tube; anthers lanceolate, dehiscing laterally. Scales 4-5 outside the staminal-tube, alternate with the stamens. Ovary 1-5-celled according to various authorities; ovule solitary, erect. Fruit sub-globose.

Found in Arabia and Abyssinia. A native of the mountains of the Circars, Roxb. Represented in the Kew herbarium by a small flowering specimen marked " Bombay Capt. Geburne ". Dr. Cooke states in Fl. Pres. Bomb. 2, 123, that the ticket on the specimen is not in Capt. Geburne's handwriting but apparently in that of Planchon. The species is very doubtfully indigeous in this presidency.

Order LX.—APOCYNACEÆ.

Trees or shrubs, often climbing, rarely herbs, usually with milky juice. Leaves opposite or whorled, rarely alternate, entire; stipules O or glandular. Flowers regular, hermaphrodite, in terminal or axillary cymes. Calyx free, 5-divided, often glandular at the base. Corolla gamopetalous, 5-lobed; lobes spreading, usually twisted-imbricate in bud, rarely valvate. Stamens 5, on the throat or mouth of the corolla which is often hairy or closed with a corona of scales; filaments short; anthers conniving in a cone round the stigma or free, sometimes spurred at the base; pollen granular. Disk annular, cup-shaped, lobed or O. Ovary 1-celled with two parietal placentas or 2-celled with axile placentas or of two distinct or connate carpels; ovules in each cell 2 or many, rarely solitary. Fruit a drupe or berry or of two follicles opening along the inner-edge. Seeds pendulous, rarely ascending or peltately attached, often winged at one or both ends or with a terminal coma of long silky hairs; albumen hard, fleshy, scanty; cotyledons flat, concave, contorted or convolute; embryo straight; radicle superior.

Anthers included, free from the stigma.
- Fruit indehiscent; seeds without coma or wings.
  - Leaves opposite. Ovary of 2, combined carpels.
    - Fruit an ovoid or globose, many-seeded berry — 1. Carissa.
  - Leaves whorled. Ovary of 2, distinct carpels.
    - Fruit of 2, 1-seeded drupes ... ... — 2. Rauwolfia
  - Leaves alternate. Fruit of 1, 1-2-seeded, fibrous, woody carpel ... ... — 3. Cerbera.
- Fruit of 2 follicles; seeds winged or comose.
  - Ovules 2-seriate.
    - Leaves alternate. Seeds winged. Erect shrub — 4. Rhazya.
  - Ovules many-seriate.
    - Leaves whorled. Seeds winged. Climbing shrub ... ... — 5. Ellertonia.
    - Leaves alternate. Seeds winged. Tree ... — 6. Plumeria.
    - Leaves whorled. Seeds comose at both ends. Trees or shrubs .. .. — 7. Alstonia.
    - Leaves opposite. Seeds with a coma at the apex. Trees or shrubs ... ... — 8. Holarrhena.

Fruit more or less fleshy, dehiscent; seeds without a coma, immersed in pulp ... ... 9. Tabernamontana.

Anthers conniving in a cone round the stigma included or exserted.

Anthers more or less exserted.

Filaments twisted. Carpels connate in flower 10. Parsonsia.

Filaments not twisted. Ovary of 2 distinct carpels.

Corolla rotate, throat naked. Climbers ... 11. Vallaris.

Corolla salver-shaped, throat with fimbriate scales. Trees ... ... 12. Wrightia.

Anthers included.

Leaves whorled. Corolla-throat with 5 broad scales ... ... 13. Nerium.

Leaves opposite. Corolla large; throat without scales; lobes overlapping to the right.

Corolla bell-shaped. Disk deeply 5-lobed..... 14. Beaumontia.

Corolla salver-shaped. Disk thick, annular or cupular ... ... 15. Chonemorpha.

Corolla small; lobes overlapping to the right and nearly straight in bud. Seeds glabrous. 16. Aganosma.

Corolla small; lobes sharply twisted to the left. Seeds comose.

Corolla-lobes with the tips not deflected. Disk cupular ... ... 17. Anodendron.

Corolla-lobes with the tips deflected. Disk free, 5-lobed ... ... 18. Ichnocarpus.

1. CARISSA, L.

Prostrate, erect or climbing shrubs, armed with axillary spines. Leaves opposite, coriaceous. Flowers in peduncled, terminal and axillary di-trichotomous cymes. Calyx 5-partite. Corolla hypocrateriform; tube cylindrical; lobes spreading. Stamens included. Ovary 2-celled; ovules several in each cell; style filiform; stigma thickened, minutely 2-fid. Fruit a globose or ovoid berry. Seeds usually 2, peltately attached to the septum; albumen fleshy.

Spines usually straight.

Leaves glabrous. Berry size of a cherry ... ... 1. C. Carandas.

Leaves small, densely and finely pubescent. Berry size of a pea ... ... 2. C. spinarum.

Spines decurved

An erect shrub ... ... 3. C. macrophylla.

A large climbing shrub ... ... 4. C. suavissima.

1. C. Carandas, Linn.; A. DC. Prodr. VIII, 332; Fl. Br. I. 3, 630; Brandis For. Fl. 320; Dalz. & Gibs. Bomb. Fl. 143; Bedd. Fl. Sylv. 156; Cooke Fl. Pres. Bomb. 2, 124; Gamble Ind. Timb. 479; *C. spinarum,* A. DC.; Brandis Ind. Trees, 455. *Karunda, corinda, carwand, hartundi,* Vern.; *Kawli-balli, karekai,* K.

Fig 393. Carissa Carandas, Linn.

A large gregarious erect or climbing evergreen shrub; branches glabrous, rigid divaricate; spines horizontal, 1″-1·5″ long, stout, sharp, usually straight, often bifurcate and branched. Leaves broadly-ovate, 1·5″-3″ by 1″-2,″ obtuse, sometimes emarginate, often mucronate at the apex, subacute at the base, thinly coriaceous, glabrous, dark-green shining above, paler beneath; lateral-nerves 3-4 pairs, looping within the margin, distinct on both surfaces; petioles ·1″-·2″ long. Flowers white, often tinged with pink, scarcely scented, in terminal, peduncled 10-20-flowered cymes, shorter than the leaves; peduncles glabrous, ·5″ long; pedicels short; bracts subulate, pubescent. Calyx ·2″ long; tube pubescent; lobes as long as the tube, linear-acute, ciliate. Corolla-tube cylindric, glabrous, swollen and pubescent near the top; lobes lanceolate-acute, shorter than the tube, pubescent, spreading. Stamens included. Ovary glabrous, with 4 ovules in

each cell. Fruit globose or ovoid and pointed, about ·5″ in diameter, black-purple when ripe, filled with much milky juice; seeds flat, usually 4.

Monsoon-forests of India, from the Punjab to Ceylon, Burmah and Malacca, often cultivated; throughout the presidency, common in the Konkan and North Kanara; the climbing form is found on the higher Konkan ghâts and in the Khandesh Akrani at an elevation of 3500′. Fl. Jan.-Apl. Fr. ripe May-June. A large evergreen, erect or climbing shrub. The climbing stems about 6″ in diameter are often armed with curved deflected spines. Bark light-grey, scaly. Wood yellowish-grey, hard, smooth and close-grained. Pores very small, equally distributed. Medullary rays very fine and numerous. Weighs 45 lbs. to the cub. ft. Forms excellent, impassable fences and is sometimes grown in the gardens of Europeans on account of the fruit which makes good jelly.

2. C. spinarum, A. DC. Prodr. VIII, 332; Fl. Br. I. 3, 631; Cooke Fl. Pres. Bomb. 2, 125; Gamble Ind. Timb. 480; *C. diffusa,* Roxb.; Brandis For. Fl. 321; Bedd. Fl. Sylv. t. 157; *C. hirsuta,* Roth; Dalz. & Gibs. Bomb. Fl. 143.

A low erect or prostrate, evergreen shrub; branches divaricate, often zigzag; branchlets pubescent or tomentose; spines usually slender, ·5″-·75″ long, sometimes bifurcate at the apex. Leaves ovate or narrowly elliptic, 1″-2″ by ·5″-1″, obtuse or acute, sometimes emarginate and often mucronate at the apex, acute at the base, coriaceous, more or less pubescent or tomentose on both sides; lateral-nerves 2-4 pairs often looping within the margin; petioles ·1″-·2″ long. Flowers white, about ·5″ long, sometimes tinged with pink, in axillary or terminal short-peduncled, usually 3-flowered clusters; buds linear, straight or curved; bracts linear, pubescent. Calyx divided to near the base, ·12″ long; lobes linear-acute pubescent and ciliate on the margins. Corolla pubescent; tube ·25″ long; lobes linear-acute, shorter than the tube. Ovary 2-celled; cells 2-ovuled. Fruit globose or ovoid, ·25″ in diameter, black when ripe, shortly stalked, 2-4-seeded.

Wild in most parts of India in the drier regions from the Himalayas to Ceylon, on the hills of the Deccan; common in the Dharwar and Belgaum districts on stony ground. Fl. C. S. Fr. Aug.-Sept. A small, thorny, evergreen, sometimes prostrate shrub. Wood hard, smooth, close-grained. Annual-rings distinct. Used for turning and combs. Fruit smaller and much sweeter when ripe than that of *C. Carandas.*

3. C. macrophylla, Wall. Cat. 1679; Fl. Br. I. 3, 631; Gamble Ind. Timb. 480; *C. lanceolata,* Dalz. & Gibs. Bomb. Fl. 143; *C. Dalzellii,* Bedd. Fl. Sylv. 156; *C. inermis,* Vahl. Symb. 3, 43; Cooke Fl. Pres. Bomb. 2, 125.

A large erect, evergreen, nearly glabrous shrub; branches dark-brown, striate; spines 1·5″-2″ long, stout, sharp, recurved. Leaves broadly ovate, 3″-4″ by 1·5″-2″, acute or shortly and finely acuminate at the apex, acute at the base, thinly

coriaceous, dark-green shining above, paler beneath; lateral-nerves 3-6 pairs, looping within the margin. Flowers white, 1″-1·5″ long, in terminal or axillary, shortly peduncled, generally few-flowered, puberulous or nearly glabrous, corymbose cymes; pedicels ·1″ long or 0; bracts short, subulate. Calyx ·2″ long; lobes as long as the tube, linear-acute, ciliate. Corolla-tube 1·5″ long, slender, constricted at the throat; lobes ·5″ long, linear-acute. Fruit globose, purple, about 1″ in diameter, filled with milky juice.

Western ghâts from the Konkan southwards to Courtallum; common in rain-forest along the Konkan and North Kanara ghâts, abundant near the coast on the hills about Karwar. Fl. Jany.-Feb. Fr. ripe June. The large plum-like fruit is very palatable.

4. C. suavissima, Bedd. mss.; Fl. Br. I. 3, 632 differs from *C. macrophylla,* by its climbing habit, somewhat larger and quite glabrous flowers, also by the much shorter spines. The Kanara plant described as *C. suavissima*, in my Trees &c. Bomb., 228 is a lofty climber provided with recurved, large spines and the calyx sometimes slightly puberulous, otherwise exactly like *C. macrophylla,* from which I am unable to distinguish it. Common on the Nilkund and Southern ghâts of N. Kanara in rain-forest. Fl. and Fr. same times as *C. macrophylla.* All the above described species of *Carissa* are very closely allied only apparently differing in habit, vestiture of leaves and size of flowers and fruit.

2. RAUWOLFIA, Linn.

Glabrous perennial herbs, shrubs or small trees with milky juice. Leaves whorled, rarely opposite. Flowers in terminal, peduncled cymes. Calyx 5-divided. Corolla salver-shaped; tube inflated above the middle, pilose within; lobes 5, overlapping to the left. Stamens included in the inflated part of the corolla-tube. Disk large, cup-shaped or annular. Ovary of 2 distinct or slightly connate carpels; ovules 2, collateral in each carpel. Fruit a single or didymous drupe, usually 1-seeded; albumen fleshy.

A small herbaceous shrub. Corolla-tube long, slender, inflated near the middle ... ... 1. R. serpentina.

Large shrub or small tree. Corolla-tube short, broad, inflated at the top ... ... 2. R. densiflora.

1. R. serpentina, Benth. in Gen. Plant. 2, 695; Fl. Br. I 3, 632; Cooke Fl. Pres. Bomb. 2, 127; *Ophioxylon serpentinum,* Linn.; Dalz. & Gibs. Bomb. Fl. 143; Bedd. Fl. Sylv. 156. *Harki,* M.

An herbaceous perennial with a long, irregularly nodular, yellowish rootstock;

stems usually simple. Leaves 3-verticellate, ovate-lanceolate, 4″-5″ by 1″-1·25″, acute or acuminate, often apiculate at the apex, gradually tapering at the base into an obscure petiole, glabrous, thin, bright-green above, glaucous beneath; lateral-nerves about 10 pairs, very slender; petioles short or obscure. Flowers shortly pedicelled, in long-peduncled, terminal, rarely axillary, corymbose, cymose heads; pedicels and the small, triangular acute bracts bright-red. Calyx ·1″ long, deeply divided, bright-red; lobes triangular-acute. Corolla white, tinged with violet; tube ·5″ long, slender, thickened slightly about the middle at the insertion of the stamens and often curved upwards; lobes broad-ovate, obtuse, spreading. Disk cup-shaped, membranous. Fruit of 2 separate or slightly connate, ovoid, pointed, black shining drupes, each ·25″ in diameter.

Tropical Himalayas, Sikkim, Assam, Pegu and along the ghâts from the Konkan to Ceylon; throughout the moist forests of the Konkan and North Kanara, usually in shady open places near rain-forest. A conspicuous flowered, simple-stemmed undershrub 2′-3′ high. The white, tubular, often curved corollas contrast strongly with the bright-red calyces and pedicels. The root is sometimes employed in cases of hydrophobia in native medicine. Fl. May. Fr. June.

2. R. densiflora, Benth. in Gen. Pl. 2, 697; Fl. Br. I. 3, 263; Cooke Fl. Pres. Bomb. 2, 127; *R. decurva*, Hook. f.; Fl. Br. I. 3, 633; *Ophioxylon neilgherrense*, Dalz. & Gibs. Bomb. Fl. 144; *O. densiflorum*, Bedd. Fl. Sylv. 156.

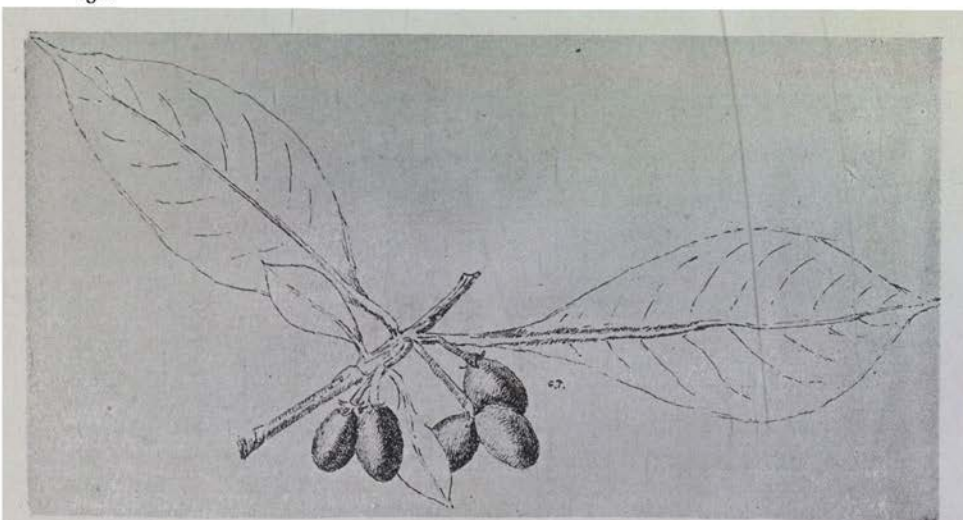

Fig 394. Rauwolfia densiflora, Benth.—*Fruit.*

A small or large shrub, sometimes a small tree; branches glabrous, rough with raised lenticels. Leaves whorled at the ends of the branches, obovate or elliptic-lanceolate, 2″-6″ by ·5″-2·5″, acute or acuminate at the apex, tapering at the base, thin, glabrous, pale beneath; lateral-nerves 12-20 pairs, slender, looping within the margins, more or less distinct; petioles ·25″-·5″ long. Flowers white, glabrous, appearing with the young leaves, in terminal, peduncled, lax, few-flowered, corymbose cymes; peduncles flattened, 1″-2″ long, often several-fascicled, erect or decurved; bracts minute. Calyx deeply 5-lobed; lobes ·1″ long, linear-acute. Corolla-tube cylindric, ·15″ long, slightly inflated at the top; lobes hairy within, nearly as long as the tube, broad, spreading. Fruit ovoid, ·5″ in diameter, black when ripe; seed flat, rough.

Fig 395. Rauwolfia densiflora, Benth. Var. *decurva*.

Khasia Mountains, 1-4000′, Western peninsula from the Konkan southwards, Ceylon up to 6000′. In the moist forests of the ghâts, common in the Supa sub-division of North Kanara in rain-forest; on the Amboli ghât near Belgaum attains to the dimensions of a small tree 30′ high with a short stem 9″ in diameter. Flowers on decurved peduncles. *R. decurva*, Hook f., is in my opinion, only a variety of *R. densiflora*, Benth. The decurved, short peduncles seem to be a constant character of the form *decurva*. Dr. Cooke however states (Fl. Pres. Bomb. 2, 128) that he has found erect and decurved peduncles on the same plant.

3. CERBERA, Linn.

Small trees. Leaves alternate. Flowers large, white or red, in terminal cymes. Calyx 5-partite; lobes long, recurved. Corolla funnel-shaped; tube short; throat ribbed or scaly; lobes broad, longer than the tube. Stamens

inserted about the middle of the tube, included; anthers lanceolate, apiculate, connate by their points above the stigma but free from it; carpels 2, distinct; ovules 4 in each ovary or carpel; style filiform; stigma large, ovoid, 2-lobed. Fruit an ellipsoid drupe with a woody, fibrous mesocarp. Seeds broad, compressed, peltately attached to the placenta; albumen O; cotyledons thin, fleshy; radicle short.

C. Odollam, Gærtn. Fruct. 2, 193, t. 124; Fl. Br. I. 3, 638; Brandis For. Fl. 322; Bedd. Fl. Sylv. 157; Wight Ic. t. 441; Cooke Fl. Pres. Bomb. 2, 128; Gamble Ind. Timb. 482. *Sukanu*, M.

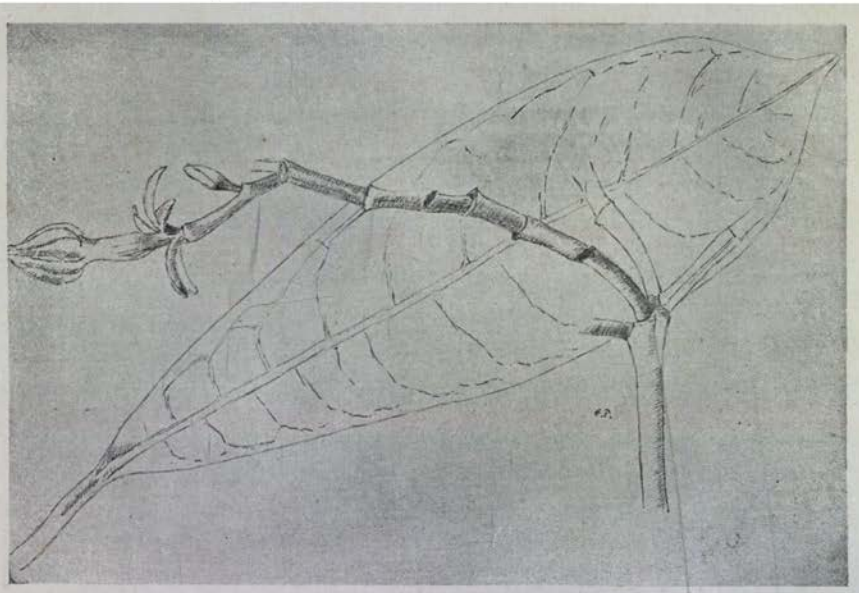

Fig 396. Cerbera Odollam, Gærtn.

A small littoral tree; branchlets whorled, stout, glabrous shining, marked with the scars of fallen leaves. Leaves alternate, crowded at the ends of the branchlets, lanceolate or ovate-oblong, 3″-8″ by 1·25″-2″, coriaceous, abruptly acuminate at the apex, tapering at the base, coriaceous, leathery, glabrous, drying black; lateral-nerves numerous at right angles to the midrib, uniting in a more or less indistinct intramarginal-nerve; petioles 1″-2″ long. Flowers, large, white, sweet-scented, in stout, terminal, peduncled cymes; pedicels stout; bracts ·5″-1″ long, ovate-acuminate, coloured, caducous. Calyx ·75″ long, deeply divided; lobes lanceolate-acuminate, reflexed. Corolla 2·5″ across; tube ·5″-·75″ long;

throat yellow, closed by 5 rib-like, hairy scales; lobes broad, overlapping to the left in bud. Anthers sessile, conniving at the tips over the thick, capitate, stigma. Ovary bicarpellary, united by a single filiform style. Fruit smooth, green, ovoid or subglobose, fibrous, flattened, 2″-4′ long; fibres free at the top; seed usually solitary.

Salt swamps of the coasts of India and Ceylon, South Konkan and North Kanara; planted in hedges near the sea-coast at Murdeshwar. Fl. at different times throughout the year. Bark white, filled with much acid, milky juice. Wood grey, soft, spongy. Annual-rings distinct. Pores small, in short, radial lines. Medullary rays indistinct. The poisonous seeds yield an oil used for burning and the wood is sometimes used for fuel.

4. RHAZYA, DCNE.

Erect shrubs. Leaves alternate, thick, glabrous. Flowers in large, terminal or axillary cymes. Calyx short, 5-divided; lobes acuminate. Corolla hypocrateriform; tube long cylindric; throat constricted, hairy inside; lobes 5, short, overlapping to the left. Stamens included. Disk obscure. Carpels 2, distinct; ovules many, 2-seriate in each carpel; style filiform, top broad, thickened; stigma sometimes furnished with a reflexed membrane. Follicles 2, erect, slender. Seeds winged at both extremities; cotyledons thick, oblong; albumen ruminate; radicle superior.

R. stricta, Decaisne in Ann. Nat. Sc. Ser. 2, IV, 81; Fl. Br. I. 3, 640; Brandis For. Fl. 322; Cooke Fl. Pres. Bomb. 2, 830; Gamble Ind. Timb. 482. *Sewar, sihar, hisawarg,* Sind.

A gregarious, glabrous, leafy under-shrub with few branches. Leaves linear-lanceolate, 2″-3″ by ·3″-·6″, acute at the apex, gradually tapering and sessile at the base, leathery, yellow when dry; nervation indistinct. Flowers white, odorous, in short, axillary or terminal, many-flowered, peduncled cymes; peduncles pubescent, about 1″ long; pedicels short; bracts lanceolate, leafy; bracteoles linear, acute, pubescent and ciliate, persistent. Calyx ·5″ long, glabrous; lobes thick, triangular-acute. Corolla about ·5″ long, inflated in the upper-half; throat hairy, the lower half silky below the stamens; lobes ·1″ long, ovate, acute, spreading. Style ·15″ long, filiform. Follicles cylindric, in pairs, erect, 1·5″-3″ long by ·15″-·25″ thick, glabrous, striate, slightly curved; seeds oblong, irregularly compressed, about ·15″ long, brown, rugose, with small membranous wings at the extremities.

Trans-Indus territory, Salt range and at Peshawar; dry plains of Sind and Afghanistan, gregarious over considerable areas of desert. A low, stout, leafy shrub. Fl. Apl. Wood used for fuel and the dried fruit for coagulating milk in the manufacture of cheese in Baluchistan. The fruit and leaves are used in

native medicine as a bitter tonic and the leaves are also after the bitterness has been removed by steeping for sometime in water given as fodder to goats.

5. ELLERTONIA, WIGHT.

Glabrous, climbing shrubs. Leaves opposite or ternately whorled. Flowers in terminal cymes. Calyx small, deeply 5-fid. Corolla hypocrateriform; tube cylindric; lobes 5, overlapping to the left. Stamens inserted in the middle of the corolla-tube with very short, ciliate filaments. Carpels 2, distinct; ovules numerous, 2-many-seriate; style slender; stigma ovoid with a divided apiculus at the top. Follicles 2, linear, spreading. Seeds 2-seriate, winged above and below; albumen scanty; cotyledons thin; radicle superior.

E. Rheedii, Wgt. Ic. t. 1295; Fl. Br. I. 3, 641; Cooke Fl. Pres. Bomb. 2, 131; Rheede Hort. Mal. IX. t. 14.

A glabrous, woody climber; branches slender, dark-brown, striate, sparsely lenticellate. Leaves oblong or ovate, 3″-5″ by 1·25″-1·75″, acute or acuminate at the apex, subacute at the base, thinly coriaceous, closely covered with small, irregularly shaped, angular, black spots on the upper, bluish surface; lateral-nerves 12-15 pairs, slender and distinct beneath, obscure above; margins thin; petioles ·25″-·5″ long. Flowers white, in terminal, long-peduncled, few or many-flowered branched, corymbose cymes; peduncles 1-5-fascicled, 2″-3″ long; pedicels about ·25″ long, slender; bracts small, triangular-acute. Calyx glabrous, ·05″ long, triangular-acute with membranous margins. Corolla ·6″ long, often curved; tube slender, ·3″ long, inflated at the insertion of the stamens about the centre; lobes linear-acute about ·25″ long. Anthers linear-apiculate, free. Ovary conical, glabrous; style filiform; stigma with 2 linear divisions. Follicles divaricate, sessile, cylindrical, 2″-4″ long by ·25″-·5″ thick, acute, coriaceous; seeds elliptic, about 1″ long, winged at the ends; nucleus flattened.

Western peninsula on the ghâts from the Konkan southwards to Malabar, endemic. A rare climber; it is however locally common in the rain-forest below Ainshi, (N. Kanara) at about 1000′ elevation. Fl. C. S. Fr. H. S.

6. PLUMERIA, LINN.

Shrubs or trees. Leaves elongate, crowded at the ends of the branches; nerves numerous, parallel, joined by a strong, intramarginal vein. Flowers large, in terminal cymes. Calyx 5-fid, eglandular within. Corolla with spreading lobes, contorted in bud. Anthers at the base of the corolla-tube near the ovary. Carpels 2, distinct. Fruit of 2, linear-oblong follicles. Seeds winged; albumen fleshy.

P. acutifolia, Poir; A. DC. Prodr. VIII, 392; Fl. Br. I. 3, 641; Brandis For.

Fl. 233; Dalz. & Gibs. Bomb. Fl. Suppl. 52; Cooke Fl. Pres. Bomb. 2, 142; Gamble Ind. Timb. 482. *Khair-champa, son-champa, champa, chameli,* Vern. *Rhadachampo,* Guz.; *Go-sampige,* K.

A small deciduous tree with much milky juice; branches thick, cylindrical, glabrous. Leaves obovate-oblong, 8″-12″ by 2″-3,″ usually acute at both ends, coriaceous, glabrous above, more or less pubescent beneath; lateral nerves in numerous, horizontal, parallel pairs, joined by a prominent, intramarginal vein; petioles 1″-1·5″ long, sometimes with a gland at the apex. Flowers large, very fragrant, white with a pale-yellow centre. Calyx small, eglandular; lobes short,

Fig 397. Plumeria acutifolia, Poir.

rounded. Corolla salver-shaped. Follicles divaricate, 5″ long, cylindrical, rarely come to maturity in the Bombay presidency.

Probably a native of tropical America but its original home is unknown. Cultivated and naturalized in tropical India, Burmah, Siam, China and the islands of the Malay Archipelago; throughout the presidency often near temples and villages. Fl. at different times throughout the year. A moderate-sized tree. Bark grey, smooth, scaly; inner-bark full of white, sticky juice. Wood light-brown, soft. Pores few, small, in short, radial lines. Medullary rays fine, at unequal distances apart, distinct. Annual-rings distinct. Weighs about 42 lbs. to the cub. ft. The thick, milky-juice contains very little rubber, mixed with cocoanut it is used as a native remedy for itch. The fragrant flowers are frequently made into garlands. "The wood is used for making native drums." Gamble.

7. ALSTONIA, R. Brown.

Erect trees or shrubs. Leaves whorled or opposite. Flowers in terminal, paniculate, corymbose cymes. Calyx short, 5-lobed. Corolla hypocrateriform; tube cylindrical; throat hairy; lobes short, spreading, overlapping to the left. Stamens included. Disk annular, lobed or truncate or O. Ovary of 2, distinct carpels; ovules many, multiseriate in each carpel; style filiform, top ovoid or oblong; stigma minute or 2-toothed. Fruit of 2, long, slender follicles. Seeds peltately attached, densely ciliate on the margins; albumen scanty; cotyledons flat; radicle superior.

A large, often buttressed tree. Follicles 1′-2′ long		1. A. scholaris.
A shrub or small tree. Follicles 3″-5″ long	...	2. A. venenata.

1. A. scholaris, Brown in Mem. Wern. Soc. 1, 75; Fl. Br. I. 3, 642; Dalz. & Gibs. Bomb. Fl. 145; Bedd. Fl. Sylv. t. 242; Brandis For. Fl. 325; Cooke Fl. Pres. Bomb. 2, 132; Gamble Ind. Timb. 483. *Mudhol, kodale, madale, kadusale, hale*, K.; *Satwin, saptaparni*, M.; *Saitanka-jhad*, H.

A large buttressed tree; branches whorled, glabrous shining, rough with numerous lenticels. Leaves 4-7-whorled, 3″-8″ by ·75″-2·5″, obtuse or emarginate at the apex, narrowed into a short petiole at the base, coriaceous, bright-green, glabrous, shining above, paler and pruinose beneath; lateral-nerves numerous, slender, parallel, uniting very close to the margin in a distinct vein; petioles O-·5″ long with a short, hooked thick gland on the upper-side at the base. Flowers sessile or very shortly pedicelled, in many-flowered, grey-pubescent or tomentose, peduncled and branched, umbellate cymes; peduncles 2-6-fascicled, 3″-4″ long; branches whorled, ·5″-1″ long; bracts lanceolate, acute. Calyx ·1″ long, tomentose; lobes ovate-obtuse, persistent. Corolla greenish-white; tube cylindrical,

·3″ long, inflated at the top and hairy at the mouth; lobes ovate-obtuse, ·1″ long, pubescent, spreading. Disk O. Stamens included. Style filiform; stigma capitate. Follicles long cylindrical, 1′-2′ long by ·08″ thick, in pendulous clusters; seeds linear-oblong, ·25″ long with tufts of hair at each end longer than the seed itself.

Moist-forests of India from the Western Himalayas to Assam and southwards to Ceylon and Penang; throughout the presidency usually in monsoon-forest, common in the rain-forests of North Kanara. Fl. Dec-Mch. Fr. June. A very large, evergreen tree with a fluted stem. Bark dark-grey, rather rough; inner bark yellow with much milky juice. Wood white, soft, evengrained, not durable. Pores medium-sized, in short radial lines. Medullary rays fine, white, distinct, crossed by parallel, wavy lines of white tissue. Weighs 30 lbs. to the cub. ft. Used for boxes, furniture, sword scabbards, coffins &c. The bitter inner-bark known as *Dita* bark serves in medicine as a tonic and antiperiodic.

2. A. venenata, Brown in Mem. Wern. Soc. 1, 75; Fl. Br. I. 3, 642; Dalz. & Gibs. Bomb. Fl. Suppl. 52; Bedd. Fl. Sylv. 160; Cooke Fl. Pres. Bomb. 2, 132; Gamble Ind. Timb. 483.

A large shrub or small tree; branches grey, glabrous, more or less rough with large, scattered lenticels. Leaves opposite or in whorls of 3-6, ovate-lanceolate, 4″-7″ by ·75″-1·75″, finely acuminate at the apex, acute at the base, membranous, glabrous, dark-green above, pale glaucous beneath; lateral-nerves numerous, horizontal, uniting in a distinct intramarginal vein; petioles ·25″-1″ long. Flowers white, in terminal, peduncled, subumbellate cymes, sometimes with racemose branches. Calyx ·1″ long; lobes short, triangular, acute. Corolla-tube about 1″ long, very slender, swollen at the top, contracted and hairy at the throat; lobes oblong-obtuse, ·3″ long. Ovary ovoid; disk of 2 ligulate glands alternating with the carpels; style slender; stigma short, barrel-shaped, bifid. Follicles stalked, curved, 4″-5″ by ·2″ thick, glabrous, striate, narrowed gradually at both ends, long-beaked at the apex; seeds linear-oblong, ·5″ long, flat, hairy at both ends; hairs shorter than the seed.

Western peninsula from N. Kanara to the Nilgiris 2-4500′, Courtallum, Dindigal on high hills. In the rain-forests of N. Kanara near the Nilkund and Devimone ghâts. A handsome flowering shrub, sometimes a small tree 20′ high, closely allied to *A. neriifolia,* Don. a Sikkim species. Fl. R. S. Fr. Nov.-Jany.

8. HOLARRHENA, Br.

Trees or shrubs. Leaves opposite, entire. Flowers white, usually in many-flowered corymbose cymes. Calyx 5-lobed; lobes small, glandular within. Corolla hypocrateriform; tube swollen at its base round the anthers; lobes O.

spreading, twisted to the left. Stamens included; anthers mucronate. Disk O. Carpels 2, distinct; ovules numerous in each carpel; style short, filiform; stigma oblong, fusiform, tip usually entire. Fruit of 2 long, slender follicles. Seeds with a deciduous coma; albumen scanty or O; cotyledons broad, complicate, radicle superior.

H. antidysenterica, Wall. Cat. 1672; Fl. Br. I. 3, 644; Brandis For. Fl. 326; Bedd. Fl. Sylv. 160; Dalz. & Gibs. Bomb. Fl. 145; Cooke Fl. Pres. Bomb. 2, 133; Gamble Ind. Timb. 484. *Dowla, kura, indrajav,* Vern.; *Koodsaloo, korchu,* K.; *Kuda,* M.

Fig 398. Holarrhena antidysenterica, Wall.

A large glabrous or pubescent shrub or small, usually slender-stemmed tree; branchlets drooping, with smooth, purplish bark. Leaves ovate or elliptic-oblong, 3″-7″ by 2″-3·5″, acute or shortly acuminate at the apex, usually rounded or subcordate at the base, sometimes unequal-sided and with sinuate margins, thinly coriaceous, dark-green above, paler beneath; midrib broad, prominent;

lateral-nerves 10-14 pairs, prominent beneath; petioles ·1″ long, stout. Flowers white, in lax, terminal, corymbose or panicled, many-flowered, panicled cymes shorter than the leaves; pedicels slender, ·5″ long; bracts small, linear-acute. Calyx deeply divided; lobes unequal, ·15″ long, linear-acute, sometimes ciliate. Corolla ·6″-1″ long; tube slender, pubescent, ·5″ long; lobes spreading or deflexed, as long as the tube, broad obtuse. Follicles divaricate, slender, curved, 9″ or longer by ·15″ thick, glabrous, striate; seeds narrow, ·5″ long, brown, with silky-reddish hairs much longer than the seed.

Tropical Himalaya from the Chenab westwards and throughout India to Travancore and Malacca; throughout the presidency, common in deciduous monsoon-forest. Fl. Mch.-June. Fr. next March. A small, deciduous tree. Bark dark-coloured, furrowed and scaly. Wood white or grey, soft, close-grained, smooth. Annual-rings visible, but not distinct. Pores small, in radial lines. Medullary rays fine and very fine, numerous. Weighs 46 lbs. to the cub. ft. Used for carving and turning in Northern India and Madras and in Assam for furniture. Leaves, fruit, seeds and bark are employed in native medicine. The leaves are not eaten by goats and the reproduction by seed, coppice shoots and root-suckers is vigorous and abundant.

9. TABERNÆMONTANA, Linn.

Small trees or shrubs. Leaves opposite; stipules axillary. Flowers white, in axillary cymes. Calyx usually persistent, glandular within. Corolla hypocrateriform; tube cylindrical, slender; lobes overlapping to the left. Stamens inserted about the middle of the tube. Disk O. Carpels two, distinct; ovules many; styles short or long, top urceolate, ovoid or clavate; stigma short. Fruit of two, smooth or ribbed, usually many-seeded, dry or fleshy follicles. Seeds in pulp; albumen fleshy.

T. Heyneana, Wall. in Bot. Beg. t. 1273; Fl. Br. I. 3, 646; Gamble Ind. Timb. 485; *T. crispa,* Dalz. & Gibs. Bomb. Fl. 144 (not of Roxb.); *Ervatamia Heyneana,* Cooke Fl. Pres. Bomb. 2, 134. *Naglkudo, pandra-kura,* M.; *Bilikodsaloo, nagarkooda, halmeti, maddarsa,* K.

A small tree with grey smooth branches. Leaves elliptic or obovate, 3″-7″ by 1″-2·5″, acuminate at the apex, acute at the base, thinly coriaceous, glabrous, dark-green above, paler beneath; lateral-nerves 12-16 pairs, distinct with reticulate venation between; petioles ·5″ long. Flowers in terminal, corymbose, many-flowered, peduncled cymes; peduncles 1″-2″ long, 1-2 together; pedicels ·25″-·75″ long. Calyx ·15″ long, fleshy at the base; lobes short, broadly ovate, apiculate. Corolla white, very deciduous; tube cylindric ·5″-·75″ long, inflated near the top;

lobes shorter than the tube, broad falcate, spreading with crisped margins, induplicate in the club-shaped bud. Filaments short, slender; anthers yellow, longer than the filaments, linear, apiculate. Style long, slender, thickened at the apex; stigma divided into 2, short, slender lobes. Follicles yellow, sessile, 1″-1·25″ long by ·5″ thick, smooth, crescent-shaped, beaked, usually with 2 sharp side-ribs; seeds ·3″ long, immersed in red pulp.

Fig 399. Tabernæmontana Heyneana, Wall.

Western ghâts from the Konkan southwards; throughout the Konkan and North Kanara, common in rain-forest. Fl. Mch.-Apl. Fr. July-Aug. Bark grey, rough, corky, longitudinally fissured and with horizontal cracks; inner-bark white

or yellowish with much milky juice. Wood grey, smooth, very soft. Annual-rings distinct. Weighs about 28 lbs. to the cub. ft. Timber not used in North Kanara. The copious milky latex contains a small amount of rubber.

T. coronaria, Br. (*Taggar,* Vern.), is an evergreen, silvery-barked shrub commonly cultivated in gardens throughout the presidency for its very fragrant flowers, not indigenous in Western India. Flowers rainy season.

10. PARSONSIA, R. Br.

Twining shrub. Leaves opposite. Flowers small, white, in terminal or axillary, dichotomous cymes. Calyx 5-partite, glandular or O, or with 5 scales within. Corolla hypocrateriform; tube short; lobes overlapping to the right. Stamens with twisted filaments; anthers half exserted, conniving in a cone over the stigma. Disk of 5 triangular lobes or scales. Ovary 2-celled; cells many-ovuled; style filiform, top dilated, truncate; stigma columnar. Fruit cylindric; carpels at length separating from the 2 placentas. Seeds comose; albumen scanty; cotyledons flat; radicle superior.

P. spiralis, Wall. Cat. 1631; Fl. Br. I. 3, 650; Cooke Fl. Pres. Bomb. 3, 135; Gamble Ind. Timb. 486; *Heligme javanica,* A. DC.; Dälz. & Gibs. Bomb. Fl. 146.

A slender twining shrub; branches glabrous, striate. Leaves broadly ovate, 2″-6″ by 1·5″-4,″ shortly acuminate at the apex, acute, rounded or cordate at the base, thin, glabrous shining above, paler and pubescent on the nerves beneath; lateral-nerves about 6 pairs, distinct and looping within the margin; petioles ·25″-·5″ long, slightly pubescent with a spinulose, short, interpetiolar sheath at the base. Flowers yellow or greenish-white, in axillary, long-peduncled, panicled, many-flowered cymes; peduncles 1·5″-2″ long; pedicels ·25″ long; bracts small, triangular-acute. Calyx deeply divided, ·1″ long; lobes triangular-acute, glabrous, with a glandular scale inside at the base. Corolla ·3″ long; tube short, cylindrical, pubescent within; lobes about as long or slightly longer than the tube, linear-acute or oblong-obtuse. Stamens inserted near the base of the corolla-tube; filaments spirally twisted, thickened and pubescent at the base; anthers obtuse more or less exserted. Follicles straight, cylindrical, beaked, 6″ long by ·2″-·3″ thick; valves coriaceous, glabrous, separating; seeds ·5″ long, linear, slender, beaked, strongly striate, glabrous; coma at the apex about 1·5″ long.

Silhet, Pegu, Tenasserim, Malacca, Singapore, Western peninsula in rain-forest from the Konkan southwards; common on the Southern ghâts of North Kanara. Fl. at different times throughout the year.

11. VALLARIS, Burm.

Woody climbers. Leaves opposite, minutely gland-dotted. Flowers white, in axillary, dichotomous cymes or fascicled. Calyx 5-partite. Corolla hypocrateriform; tube short; lobes overlapping to the right. Stamens at the top of the tube; anthers exserted, conniving in a cone; cells spurred at the base; connective with a dorsal gland. Disk various of 5 lobes or scales. Carpels 2, connate, many-ovuled; style filiform; stigma thick. Fruit oblong. Seeds compressed, 2-seriate; tip comose; albumen scanty; cotyledons flat, thin; radicle superior.

V. Heynei, Spreng. Syst. 1, 635; Fl. Br. I. 3, 650; Dalz. & Gibs. Bomb. Fl. 144; Cooke Fl. Pres. Bomb. 2, 136; Gamble Ind. Timb. 486; *V. dichotoma,* Wall.; Brandis For. Fl. 327.

A large woody twining shrub with smooth ash-coloured, lenticellate bark; young parts and inflorescence pubescent. Leaves elliptic or obovate, 2″-3·5″ by ·75″-1·5″, acute or shortly acuminate at the apex, acute at the base, thinly coriaceous, glabrous above, paler and more or less pubescent, glandular-dotted beneath; lateral-nerves about 6 pairs, prominent beneath; venation pellucid; petioles ·5″ long with an interpetiolar, glandular sheath. Flowers white, fragrant with the odour of almonds, in many-flowered, lax, corymbose, axillary cymes; pedicels ·25″ long, slender, pubescent; bracts small, lanceolate, acute, pubescent. Calyx ·12″ long, divided to near the base; lobes lanceolate, acute, pubescent. Corolla pubescent outside; tube short, cylindric longer than the calyx-lobes; limb ·75″ across, with shallow, broad, obtuse lobes. Stamens 5; filaments broad, pubescent; anthers ivory-white, conniving in a cone round the stigma. Disk of 5 oblong, ciliate lobes. Ovary and style hairy; stigma acute. Fruit oblong, tapering from a rounded base, 4″-6″ long by 1·5″-2″ thick at the base, smooth, fibrous, fleshy, the ripe carpels ultimately separating; seeds ·5″ long, ovate, beaked; coma silky, twice as long as the seed.

Tropical Himalaya, Western peninsula from the Konkan southwards. Throughout the dry districts of the presidency also in the Konkan and North Kanara, often in hedges. Sometimes grown in gardens for its handsome fragrant flowers. Fl. Dec.-Apl. "Branches used for basket-making at Dehra Dun." Gamble.

12. WRIGHTIA, Br.

Trees or shrubs. Leaves opposite. Flowers red, white or yellow, in terminal, corymbose cymes. Calyx short, 5-divided with 5-10 scales inside at the base. Corolla salver-shaped; tube short; throat with 1-2 series of fimbriate scales

distinct or united in a ring; lobes overlapping to the left. Stamens inserted at the top of the corolla-tube with 5, exserted, conniving anthers adnate to the stigma; cells spurred at the base. Disk O. Carpels 2, many-ovuled; ovules on axile placentas; style filiform; stigma ovoid with a toothed, basal ring. Fruit of 2 linear follicles; seeds linear, numerous, tufted at the lower end; albumen O; cotyledons convolute; radicle short, superior.

Leaves glabrous. Coronal-scales distinct, fimbriate 1. W. tinctoria.
Leaves tomentose. Coronal-scales connate, short, obtuse ... ... 2. W. tomentosa.

1. W. tinctoria, Br. in Mem. Wern. Soc. I. 73; Fl. Br. I. 3, 653; Dalz. Gibs. Bomb. Fl. 145; Brandis For. Fl. 324; Bedd. Fl. Sylv. t. 241; Cooke Fl. Pres. Bomb. 2, 137; Gamble Ind. Timb. 486. *Kodmurki, kuda,* K.; *Kalakudi,* M.; *Bhurcuri,* Vern.; *Kordi,* Bhil.

A small deciduous tree; branchlets grey-puberulous or glabrous, lenticellate. Leaves ovate or oblong-lanceolate, 2·5″-6″ by ·6″-2·25″, acute or acuminate at the apex, acute at the base, thin membranous, glabrous or puberulous beneath when young; lateral-nerves 8-14 pairs, distinct beneath; petioles very short. Flowers white or yellowish, scented, ·5″-·75″ across, in axillary or terminal, lax, spreading cymes 2″-5″ broad, with corymbose, slender branches; pedicels ·5″-·75″ long; bracts small, ovate, acute. Calyx ·1″ long, more or less deeply divided; lobes glandular inside, obtuse, with scarious margins. Corolla-tube cylindric, ·12″ long; lobes ·3″ long, oblong, obtuse or acute; corona of many linear, unequal, white scales inserted with the stamens or on the corolla-lobes. Cone of anthers ivory-white or yellowish, exserted. Follicles 2, 5″-20″ long, slender, cylindric, pendulous, united at the tips, dark-brown shining, covered with raised lenticels; seeds beaked, ·5″-·75″ long; basal-coma deciduous, 1·5″ long.

Central India, Western peninsula and Burmah; throughout the presidency in deciduous forests, common in open forest on trap on the Toranmal plateau, W. Khandesh at 3500′. Fl. Mch.-Apl. Fr. Jan.-Feb. Bark scaly, smooth. Wood yellowish-white, close-grained, moderately hard. Annual-rings marked by a line of pores. Pores small, in short radial lines. Medullary rays fine and very fine, very numerous. Weighs about 50 lbs. to the cub. ft. Used for carving, turning and also for building purposes. Would not do as a substitute for boxwood as has been suggested. The leaves yield a blue dye and a kind of indigo and are used as wrappers for native cigarettes.

2. W. tomentosa, Roem. & Schultes Syst. IV, 114; Fl. Br. I. 3, 653; Dalz. & Gibs. Bomb. Fl. 145; Brandis For. Fl. 323; Bedd. Fl. Sylv. 159; Cooke Fl. Pres. Bomb. 2, 137; Gamble Ind. Timb. 487; Trimen Fl. Ceyl. 3, 137; *W.*

Wallichii, A. DC. Prodr. 8, 405; Dalz. & Gibs. Bomb. Fl. 145; Bedd. Fl. Sylv. 160. *Kala-inderjow, tambada-kuda,* Vern.; *Bili-kude gidda,* K.

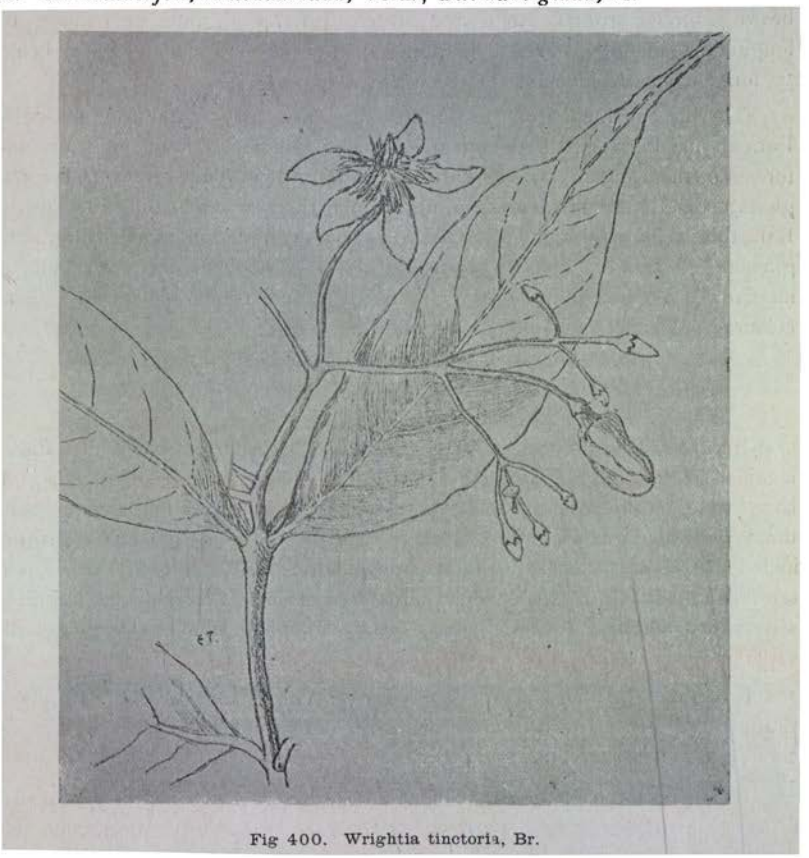

Fig 400. Wrightia tinctoria, Br.

A small deciduous tree with softly light-brown tomentose branchlets and leaves. Leaves elliptic or obovate, 2·25″-4″ by 1·2″-1·5″, shortly acuminate at the apex, acute or rounded at the base, thinly coriaceous, drying brown, pubescent above, paler and tomentose beneath; lateral-nerves 10-12 pairs, distinct on both surfaces; petioles ·25″ long. Flowers yellowish-white, with an unpleasant odour, about 1″ across, in axillary, erect, densely-flowered, corymbose cymes shorterthan the leaves; pedicels ·25″ long, tomentose; bracts lanceolate, acute, tomentose. Calyx tomentose outside, glandular within, ·2″ long; lobes short, ovate-obtuse, tomentose and ciliate on the margins. Corolla-tube ·2″ long, cylindric; lobes ·5″ long, oblong, obtuse, thick and brittle; coronal-scales orange

often laciniate, connate into a 5-lobed cup. Carpels connate into a cylindric straight or curved, shortly stalked, beaked fruit 6″-8″ long by ·3″-·5″ thick, brown glabrous, strongly striate and covered with raised white dots and with 2 longitudinal shallow grooves at the union of the carpels; seeds slender, beaked, ·5″ long; coma deciduous, 1″-1·5″ long.

Throughout India from the Indus eastwards and southwards to Ceylon, Burmah and Penang; throughout the presidency, common in the moist monsoon-forests of the Konkan, rare in North Kanara in monsoon-forest on the Supa ghâts; sometimes cultivated as an ornamental tree. Fl. Apl.-June. Fr. Jan.-Feb. Bark thin, yellowish-grey, corky. Wood yellowish-white, moderately hard, close-grained. Pores very small, in short radial lines. Medullary rays very fine and numerous. Weighs 30 lbs. to the cub. ft. Used for turning and carving. A red-coloured medicinal oil is obtained from the seeds.

13. NERIUM, LINN.

Shrubs with milky juice. Leaves narrow, opposite or whorled. Flowers medium-sized or large, in terminal cymes. Calyx-lobes with fleshy glands at the base inside. Corolla funnel-shaped; tube short; lobes spreading, unequal-sided; throat with a corona of toothed laciniate scales opposite to the lobes. Anthers included, conniving round the stigma; tips filiform; cells with long, twisted, hairy, terminal appendages. Ovary of 2 carpels, many-ovuled. Follicles adpressed, separating when ripe. Seeds villous; coma terminal; albumen fleshy; radicle superior.

N. odorum, Soland. in Hort. Kew Ed. 1, Vol. 1, 297; Fl. Br. I. 3, 655; Brandis For. Fl. 328; Grah. Cat. Bomb. Pl. 114; Cooke Fl. Pres. Bomb. 2, 143; Gamble Ind. Timb. 487. *Kanher,* Vern.

A large glabrous shrub branched from the base. Leaves entire, lanceolate, 6″ by ·5″, acute at the apex, narrowed at the base into a short petiole, coriaceous, dark-green above, paler beneath; midrib strong; lateral-nerves parallel, numerous. Flowers rose-coloured or white, inodorous or scented, in large, terminal corymbs. Calyx deeply divided; lobes lanceolate-acute, ·25″ long. Corolla-tube turbinate or tubular, about ·25″ long; lobes spreading, unequal-sided, about 1·5″ across; corona 5-7, often 5-divided; segments dark-red, striate, with long or short filiform appendages. Stamens with short, broad filaments; anthers sagittate with long twisted, hairy, terminal, tailed appendages twice as long as the cells. Fruit elongate, linear, cylindric, 6″-9″ long; seeds oblong, villous; coma terminal, caducous, about 1″ long.

Sind, Western Himalayas, Kashmir, Central India, Sind. "Grows wild by the banks of Deccan rivers" Graham. Thoroughly established along the

banks of rivers in the Khandesh and Nasik district, appears to be indigenous. Perhaps however only a variety of *N. Oleander,* L. which is cultivated in gardens throughout the presidency. Fl. nearly throughout the year.

14. BEAUMONTIA, WALL.

Large evergreen climbers. Leaves opposite. Flowers large, white, in terminal cymes; bracts leafy. Calyx 5-divided, glandular inside at the base; lobes foliaceous. Corolla bell-shaped with a short tube; lobes overlapping to the right; throat naked. Stamens at top of corolla-tube, included; anthers horny, sagittate, included in the throat of the corolla, conniving round and adnate to the stigma; cells spurred at the base. Disk deeply 5-lobed. Ovary 2-celled; cells many-ovuled; style filiform, top clavate; stigma fusiform. Fruit of 2 connate, thick, woody follicles, separating when ripe. Seeds compressed, with a coma of silky hairs at the hilum; albumen thin; cotyledons leafy; radicle superior.

B. Jerdoniana, Wgt. Ic. t. 1314-15; Fl. B. I. 3, 661; Cooke Fl. Pres. Bomb. 2, 138.

A lofty climber; branches glabrous, lenticellate. Leaves obovate-oblong, 5″-8″ by 3″-3·5″, abruptly and shortly acuminate at the apex, narrowed and subacute at the base, coriaceous, glabrous; lateral-nerves 10-12 pairs, prominent beneath; petioles ·5″ long, channelled, rufous-pubescent. Flowers white, in terminal, few-flowered, short cymes; buds clavate, acuminate, tomentose; pedicels ·25″-1″ long, more or less rusty-tomentose; bracts lanceolate, caducous. Calyx divided to the base with 10 linear basal-glands; lobes variable, lanceolate-acute or obtuse, ·75″-1″ long, rusty-tomentose outside. Corolla broadly funnel-shaped, 3″ long by 3″ across, gradually tapering towards the base; lobes 1″ long, ovate-acute or shortly acuminate. Anthers ivory-white, conniving in a cone, ·25″ long, sagittate with 2 inwardly curved spurs. Disk of 5, broad, ovate, ciliate, obtuse lobes. Fruit cylindric, 5″-10″ long by 1″-1·5″ thick, at length separating into 2 follicles; seeds ovate-lanceolate, ·75″ long; coma yellowish, 2″ long.

Western ghàts from the Konkan southwards in rain-forest, not so common as *Chonemorpha.* Sir J. Hooker says "Probably will have to be ranked as a variety of *B. grandiflora,* Wall." Fl. Nov.-Dec. Fr. ripe following Nov.-Dec. A very large climber with handsome flowers and foliage, apparently endemic in the Western peninsula and although very ornamental is not much cultivated in gardens.

15. CHONEMORPHA, G. DON.

Climbing shrubs with much milky juice. Leaves broad, opposite. Flowers large, white, in terminal, peduncled, racemose cymes. Calyx 5-cleft with a ring

of glands at the bottom of the tube. Corolla salver-shaped; tube narrow; lobes oblique, twisted in bud; throat naked. Stamens at the top of the tube; filaments short, broad, villous; anthers sagittate, connate, pungent, not exserted; cells spurred. Disk thick, annular or cupular. Ovaries 2, oblong, many-ovuled; style filiform, cleft at the base; stigma sub-clavate. Follicles straight, hard, trigonous. Seeds with a coma of long, silky hairs.

C. macrophylla, G. Don, Gen. Syst. IV. 76; Fl. Br. I. 3, 661; Brandis For. Fl. 328; Cooke Fl. Pres. Bomb. 2, 139; *Echites grandis,* Wall.; Dalz. & Gibs. Bomb. Fl. 147.

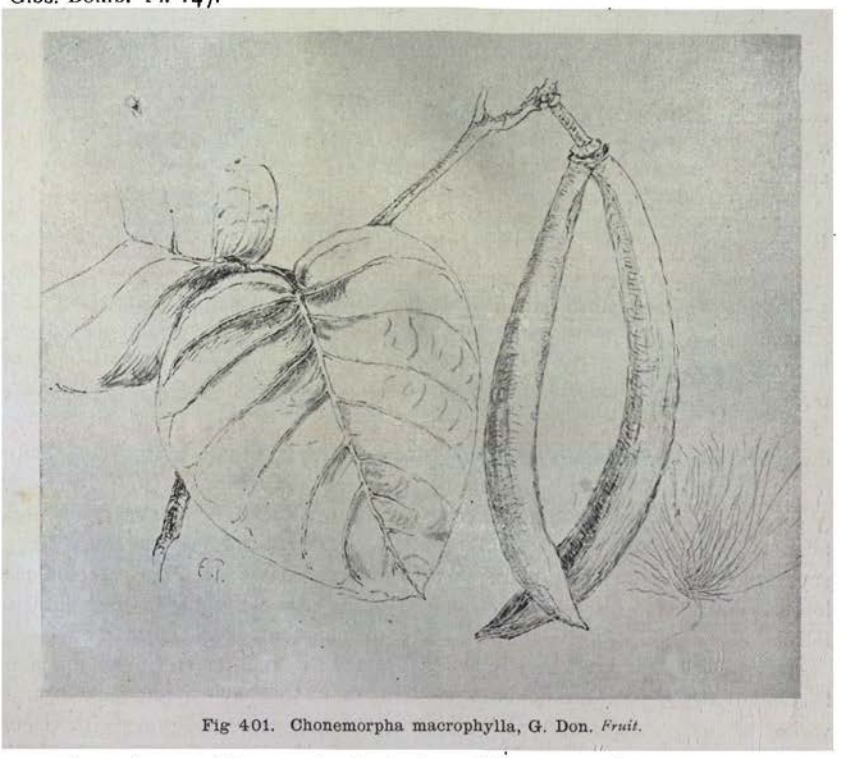

Fig 401. Chonemorpha macrophylla, G. Don. *Fruit.*

A very large twining, woody shrub; branchlets stout, pubescent or tomentose. Leaves broadly-elliptic or suborbicular, 5″-9″ by 3·5″-7″, very shortly, abruptly acuminate or obtuse at the apex, rounded or cordate at the base, coriaceous dark-green, scaberulous above, paler and usually densely tomentose beneath; lateral-nerves 8-12 pairs, prominent beneath with reticulate venation between; petioles ·5″-2″ long, stout, tomentose. Flowers fragrant, in long, stout-peduncled, terminal, corymbose, few or many flowered cymes; peduncles 3″-8″ long, tomen-

tose; pedicels stout, ·5″-1″ long, usually dilated at the top; bracts ·5″ long, ovate, acute, tomentose. Calyx glabrous, deeply divided; tube short, on a broad truncate base; lobes ·5″ long, ovate acute, slightly ciliate. Corolla white, glabrous, about 2″ long and 2·5″ or more across; tube cylindric, about 1″ long with a glabrous throat; lobes as long as or longer than the tube, broad-ovate obtuse, with undulate margins. Stamens furnished with longitudinal hairy lines and inserted on the corolla-tube within; filaments short, hairy; anthers ·5″ long, narrow, acute, with divergent spurs at the base. Follicles in pairs or single, linear, curved or straight, 9″ long by ·5″ thick, narrowed at the apex, 3-4-angled, glabrous; seeds with a silvery coma about 2″ long.

Moist forests of India from the Himalayas to Travancore, Ceylon, Malacca, and the Andamans; throughout the rain-forests of the Konkan and North Kanara, common in the Supa taluka. Fl. Apl.-Sept. Fr. C. S. A large climber with handsome flowers. The latex contains rubber apparently of poor quality.

16. AGANOSMA, G. Don.

Stout evergreen climbers. Leaves opposite. Flowers middle-sized in terminal cymes. Calyx 5-divided, glandular at the base. Corolla salver-shaped with subulate, bearded, longitudinal bands behind the anthers; lobes overlapping to the right. Stamens included; anthers sagittate, rigid, connate. Disk 5-lobed, cupular. Carpels 2, many-ovuled; style short, urn-shaped; stigma columnar. Follicles woody, coriaceous. Seeds glabrous, comose; albumen scanty; cotyledons oblong; radicle short.

A. cymosa, G. Don. Gen. Syst. IV, 77; Fl. Br. I. 3, 665; Var. 4, *elegans;* Cooke Fl. Pres. Bomb. 2, 140; *Aganosma Doniana*; Dalz. & Gibs. Bomb. Fl. 146.

A large, branched evergreen climber; branchlets glabrous or more or less tomentose. Leaves elliptic or ovate-lanceolate, 2·5″-4″ by 1·5″-2·25″, shortly acuminate or acute at the apex, subacute at the base, coriaceous, dark-green, glabrous above, pale and more or less pubescent particularly on the midrib beneath; lateral-nerves 5-6 pairs, arching upwards, distinct beneath; petioles ·5″ long, pubescent or glabrous. Flowers yellowish-white, tomentose, in terminal, peduncled, many-flowered, congested, corymbose cymes; peduncles ·5″-1″ long, tomentose; pedicels short; bracts lanceolate, acute, grey-tomentose, caducous. Calyx divided to the base; lobes ·3″ long, lanceolate, acute. Corolla-tube short with longitudinal hairy lines behind the stamens; lobes as long as the sepals, lanceolate, acute, tomentose. Anthers sagittate. Ovary pubescent. Follicles cylindric, 6″-9″ long by ·25″ thick, pubescent when young, ultimately glabrous; seeds oblong, compressed, black, glabrous; coma 1·25″ long.

Silhet, Western peninsula from Bombay to Travancore; throughout the evergreen forests of the Konkan and North Kanara. Fl. Apl.-June. Fr. next C. S. *A. caryophyllata*, G. Don; Fl. Br. I. 3, 664, is cultivated in gardens. The lax cymes and linear calyx-lobes distinguish it from the indigenous species.

17. ANODENDRON, A. DC.

Lofty climbers. Leaves opposite. Flowers small, in corymbose, axillary or terminal, many-flowered, paniculate cymes. Calyx 5-cleft, eglandular. Corolla salver-shaped; tube short, cylindrical; mouth contracted; lobes narrow, twisted to the left. Stamens with connivent, sagittate anthers adnate to the stigma; cells shortly spurred at the base. Disk cupular, obscurely 5-crenate. Ovaries 2, immersed in the disk, many-ovuled; style short, top cupular; stigmas thick, connate. Follicles divaricate, woody. Seeds compressed, ovoid, beaked with a coma of long silky hairs.

A. paniculatum, A. DC. Prodr. VIII, 444; Fl. Br. I. 3, 668; Dalz. & Gibs. Bomb. Fl. 147; Cooke Fl. Pres. Bomb. 2, 141; Gamble Ind. Timb. 489. *Lamtani,* Vern.

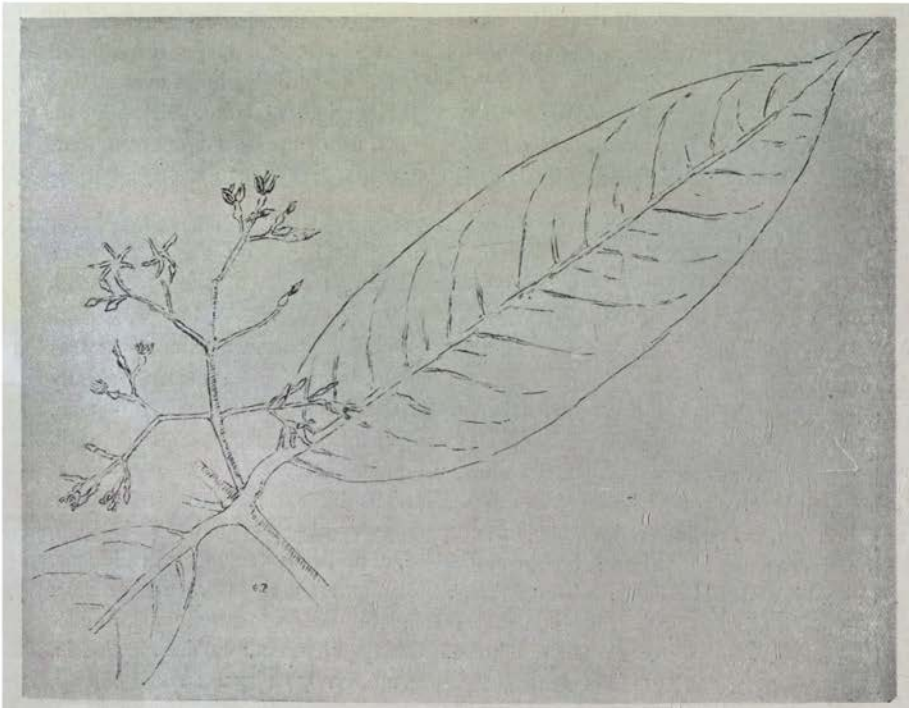

Fig 402. Anodendron paniculatum, A. DC.

A very large woody climber with smooth glabrous branchlets. Leaves ovate or elliptic-oblong, 2·5-5″ by 1″-2,″ shortly, abruptly acuminate at the apex, subacute or rounded at the base, coriaceous, glabrous; lateral-nerves 10-14 pairs, parallel, prominent; petioles ·5″ long. Flowers greenish-yellow or whitish, in terminal or axillary, lax, paniculate, large cymes with opposite, slender branches; pedicels ·25″ long, slender; bracts small, ovate-acute, glabrous, deciduous. Calyx glabrous, ·05″ long, divided halfway to the base; lobes ovate, obtuse, with white thin, slightly ciliate margins. Corolla-tube cylindric, as long as or longer than the calyx, pubescent on the throat inside; lobes ·25″ long, linear-acute, falcate, spreading, with a few scattered hairs on the upper surface. Stamens inserted near the base of the corolla-tube; filaments broad; anthers sagittate, with divergent spurs at the base. Follicles ovoid-oblong, straight, woody, divaricate, 5″-6″ long, tapering upwards to a blunt apex from a base ·75″ thick; seeds 8-12, basal, flat, lanceolate, long-beaked, 1·25″ long; coma white, 2″-3″ long.

From Silhet to Martaban, Western peninsula from the Konkan southwards to Ceylon; common in rain-forest throughout the Konkan and North Kanara. Fl. Jany.-Mch. Fr. May. A very large climber with a thick, fluted stem and brown, smooth bark which yields a strong fibre. The dense cymes of small flowers and the beaked seed with a long white umbrella-like coma are characteristic.

18. ICHNOCARPUS.

A woody twining shrub. Leaves opposite. Flowers small in long, terminal and axillary paniculate cymes. Calyx 5-divided, glandular within. Corolla hypocrateriform; throat contracted or villous; lobes hairy inside. Stamens inserted about the middle of the tube; anthers conniving over and adnate to the stigma, cells spurred at the base. Disk free, 5-lobed. Carpels 2, distinct, many-ovuled, hairy; style short; stigma columnar. Fruit of 2, very slender, terete follicles. Seeds with a slender coma at the hilum; albumen copious; cotyledons long, flat; radicle superior.

I. frutescens, Br. in Hort. Kew Ed. 2, 11, 69; Fl. Br. I. 3, 669; Brandis For. Fl. 327; Dalz. & Gibs. Bomb. Fl. 147; Cooke Fl. Pres. Bomb. 2, 142; Gamble Ind. Timb. 489. *Krishnasarwa, kantebhouri,* M.; *Gorwi-balli,* K.

A large twining shrub; branchlets long, slender, red-tomentose. Leaves ovate-lanceolate, 2·5″-3·5″ by ·75″-1·25″, acute at the apex, acute or rounded at the base, thinly coriaceous, dark-green, glabrous above, paler and reddish with the nerves pubescent beneath; lateral-nerves 5-6 pairs, prominent beneath; petioles ·25″ long. Flowers greenish-white, small, in clusters of 3, arranged in long, narrow, interrupted, red-tomentose cymes, forming large, terminal, leafy

panicles; pedicels ·15″-25″ long, pubescent. Calyx ·05″ long, shortly divided; lobes ovate-obtuse, pubescent. Corolla ·2″ long; tube inflated near the middle above the stamens; lobes linear, twisted, falcate and deflexed at the tip, white-hairy above, ciliate. Disk of 5, erect scales as long as the hairy ovaries. Follicles divaricate, 4″-5″ long, rusty-tomentose when young, at length glabrous; seeds numerous, pendulous, ·5″ long, linear, beaked, black; coma 1″ long, white.

Western Himalaya from Sirmur to Nepal, Bengal, Assam, Western and Southern India to Ceylon; throughout the presidency in deciduous forests, common in North Kanara and the Konkan. Fl. Nov.-Dec. Fr. Mch.-Apl. Bark dark-brown with vertical fissures. Wood white, soft. Yields a good fibre. Brandis (For. Fl. 527) states that the root has been used as a substitute for *Sarsaparilla*. Roots and leaves are used in native medicine.

Order—LXI. ASCLEPIADACEÆ.

Herbs or shrubs, mostly twining. Leaves opposite or whorled, rarely alternate. Flowers usually middle-sized or small, rarely large, regular, bisexual, pentamerous, in axillary, interpetiolar or terminal umbels or fascicles. Calyx inferior, 5-divided to the base; sepals imbricate in bud. Corolla gamopetalous; lobes valvate or contorted in bud, usually overlapping to the right; tube short, often with a ring of hairs, scales, or processes (outer or corolline-corona). Stamens 5 at the base of the corolla; filaments connate or rarely free. The fleshy staminal-column usually bears attached to the filaments or back of the anthers a ring or series of scales or processes (inner or staminal-corona); anthers crowning the column, connate or free, adnate to the stigma by the connective, tip often produced into an inflexed membrane; pollen in 1-2 granular or waxy masses in each cell; masses united in pairs or fours to a dark-coloured gland (the pollen-carrier or corpuscle) which lies on the edge of the stigma. Ovary superior of two distinct carpels within the staminal-column; styles 2, short, united by the stigma or style-table which is 5-angled with the stigmatic surface underneath. Fruit of 2 follicles. Seeds compressed, usually winged and plumose; albumen copious, dense; radicle short, inferior.

A distinct Natural Order, mostly woody twiners containing however few species of interest to the Forester. *Calotropis* a wide spread and conspicuous genus of erect shrubs yields excellent fibre. The latex of *Cryptostegia grandiflora,* Br. an introduced climber common in the Deccan contains abundance of Rubber of good quality. Several species are very ornamental garden plants and many others contain valuable fibres or possess useful medicinal properties.

Filaments usually free; pollen-masses granular.		
Corolla-lobes valvate	1.	Hemidesmus
Corolla-lobes contorted.		
Flowers very large	2.	Cryptostegia
Flowers middle-sized.		
Corolla-lobes long, linear, glabrous ...	3.	Cryptolepis
Corolla-lobes elliptic-oblong, bearded inside	4.	Periploca
Filaments completely connate; pollen-masses waxy.		
Anthers with a membranous inflexed tip.		
Pollen-masses 2 in each anther-cell (20 in all).		
Corolla-lobes overlapping to the left, glabrous	5.	Toxocarpus
Corolla-lobes valvate, villous at the tip inside	6.	Genianthus

Pollen-masses solitary in each cell (10 in all).
Pollen-masses pendulous.
Leafy erect shrubs ... ... 7. Calotropis
Leafy twining shrubs.
Corolla funnel-shaped. Follicles softly spinose ... ... 8. Dæmia
Corolla rotate. Follicles smooth.
Flowers large, purple ... ... 9. Holostemma
Flowers small, greenish ... ... 10. Cynanchum
Leafless trailing shrubs ... ... 11. Sarcostemma
Pollen-masses erect.
Corona corolline. Flowers small ... ... 12. Gymnema
Corona staminal.
Corolla-lobes contorted.
Flowers middle-sized; corolla salver-shaped ... ... 13. Pergularia
Flowers small; corolla rotate.
Coronal-lobes membranous, 2-fid ... 14. Cosmostigma
Coronal-lobes tubercular, fleshy ... 15. Tylophora
Flowers middle-sized; corolla rotate, bright-green... ... ... 16. Dregea
Corolla-lobes valvate.
Corolla rotate.
Leaves thin ... ... 17. Heterostemma
Leaves thick fleshy ... ... 18. Hoya
Corolla ovoid-urceolate, tubular or disciform 19. Oianthus
Anthers without a membranous inflexed tip ... 20. Leptadenia

1. HEMIDESMUS, Br.

Twiners. Leaves elliptic-linear. Flowers small, greenish-purple, in axillary, subsessile cymes. Sepals glandular within. Corolla rotate, reddish; tube very short; lobes thick, valvate. Coronal-scales 5, short, thick, on the corolla-throat. Stamens inserted at the base of the corolla-tube; filaments distinct; tips of the anthers connate, inflexed, membranous; pollen-masses in pairs in each cell, granular; appendages of the corpuscles dilated or hooded. Style-table or stigma 5-angled, flat on the top. Follicles slender, divaricate, smooth. Seeds comose.

H. indicus, Br. in Mem. Wern. Soc. 1, 57; Fl. Br. I. 4, 5; Dalz. & Gibs. Bomb. Fl. 147; Cooke Fl. Pres. Bomb. 2, 146. *Indian Sarsaparilla. Nannari,*

Vern. *Uparsal, sariva, anant-vel,* M.; *Sugankha-palada-gidda,* K.

A perennial shrub with a woody rootstock and numerous slender, twining or prostrate branches, thickened at the nodes. Leaves very variable from linear-lanceolate to elliptic-oblong, 2″-4″ by ·3″-1·5″, acute or acuminate at the apex, acute at the base, thinly coriaceous, dark-green glabrous or with small raised dots and irregular white patches above, paler and sometimes pubescent beneath; petioles very short. Flowers crowded on short, axillary, opposite, bracteate peduncles; bracts numerous, ovate, acute. Calyx ·1″ long; lobes ovate-acute with membranous, ciliate margins. Corolla ·3″ across; lobes valvate, triangular-ovate, acute or acuminate, wrinkled and purple within, greenish outside. Stamens with short filaments; anthers with a broad, shortly produced connective. Follicles 4″-5″ long by ·25″ thick, slender, cylindrical, tapering, and curved, glabrous, striate; seeds oblong, ·25″ broad, black, flattened; coma about 1″ long, silvery-white.

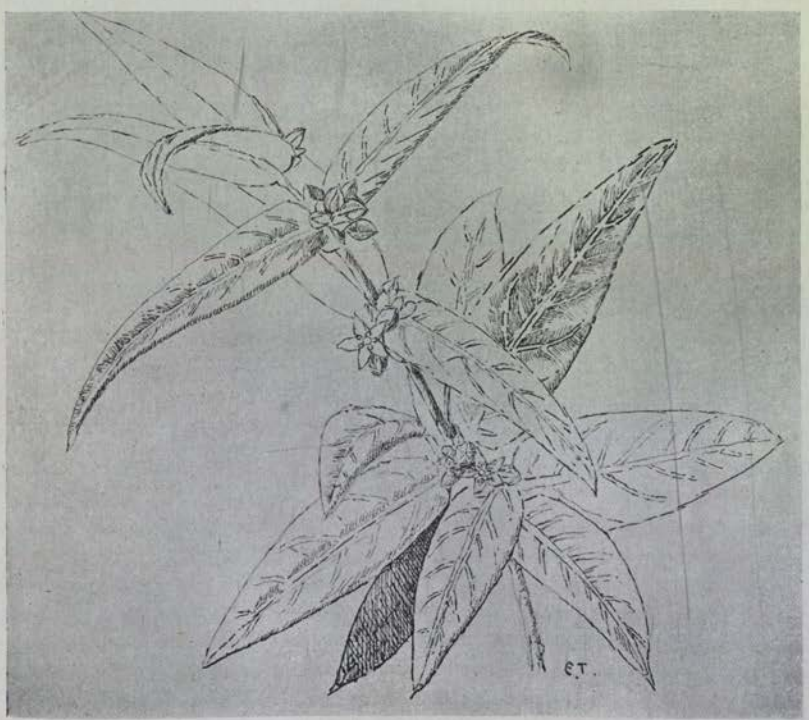

Fig 403. Hemidesmus indicus, Br.

Northern India from Banda to Oudh and south to Travancore and Ceylon. Throughout the presidency, common in hedges. Fl. throughout the year. The root is a tonic medicine used as a substitute for *Sarsaparilla* in Southern India.

2. CRYPTOSTEGIA, Br.

Lofty climbers. Leaves opposite, elliptic. Flowers large, in terminal trichotomous cymes. Sepals lanceolate. Corolla with a short tube expanding above into a broad campanulate cup; lobes broad, contorted in bud. Coronal-scales corolline, inserted at the top of the corolla-tube, subulate, entire or cleft. Stamens with short filaments; anthers adnate to the convex style-table, acute; polien-masses in pairs in each cell, granular; appendages subspathulate. Follicles thick, hard, divaricate, sharply triangular-winged, furrowed between the wings. Seeds comose.

C. grandiflora, Br. in Bot. Reg. (1819). t. 435; Fl. Br. I. 4, 6; Grah. Cat. Bomb. Pl. 122; Dalz. & Gibs. Bomb. Fl. Suppl. 54; Cooke Fl. Pres. Bomb. 2, 180. *Vilayti-vacundi*, Vern.

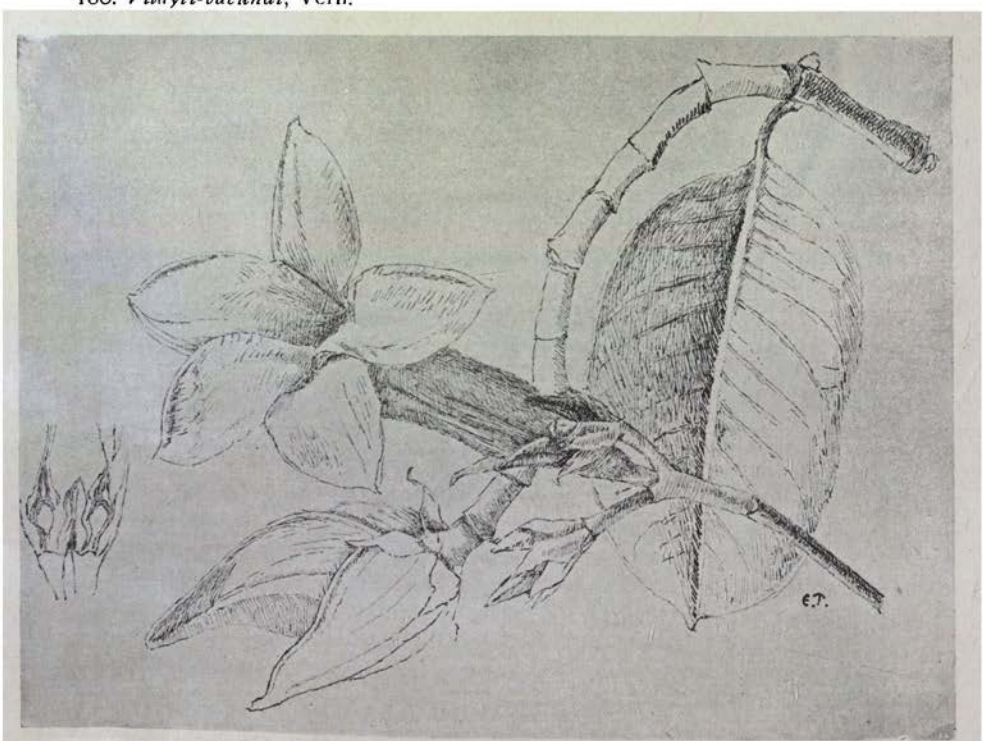

Fig 404. Cryptostegia grandiflora, Br.

A large climbing shrub, containing abundant milky juice; branchlets wrinkled, glabrous. Leaves ovate, elliptic, 2″-5″ by 1·25″-2·25″, acute or abruptly acuminate at the apex, cuneate at the base, coriaceous, glabrous, shining; lateral-nerves numerous, parallel, indistinct; petioles about ·5″ long, channelled above. Flowers large, (very large for the order,) 2″ and more long by 3″ across in the open flower, in terminal usually glabrous, few-flowered, bracteate cymes; bracts caducous; pedicels ·4″ long, grey-pubescent. Sepals linear-lanceolate, acute ·5″ long by ·15″ broad, grey-pubescent on the outside. Corolla broadly campanulate, 2″-3″ across, lobes broadly-ovate, acute; coronal-scales divided into 2 long, filiform segments. Follicles 4″-5″ long, by 1″ thick, at the base, narrowed upwards, straightly divaricate with acute margins; seeds compressed; coma 1·5″ long, silky, shining.

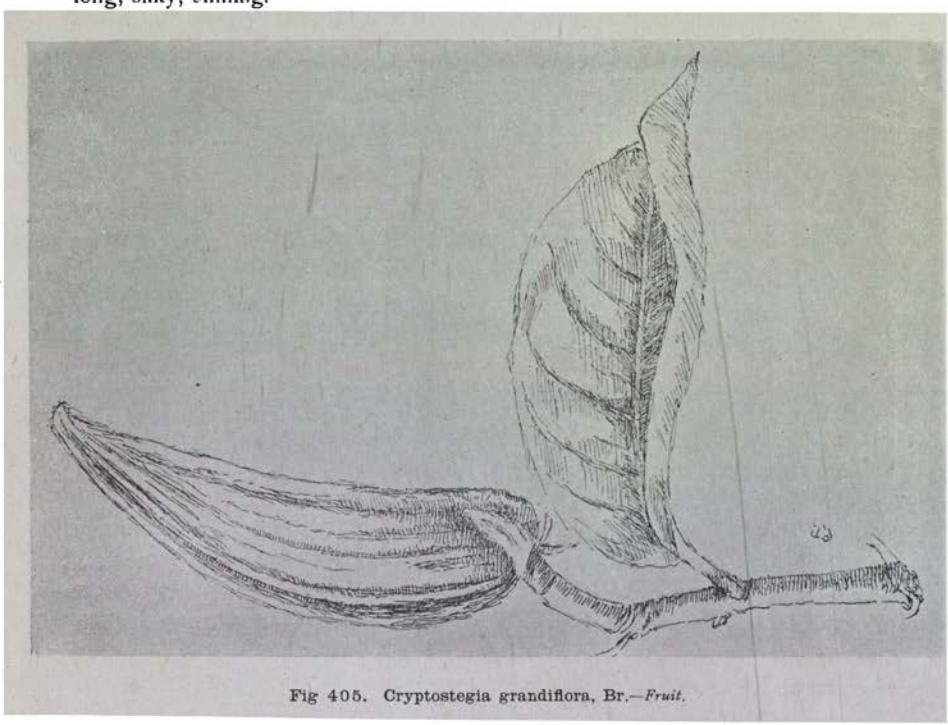

Fig 405. Cryptostegia grandiflora, Br.—*Fruit.*

Introduced and spread throughout the dry Deccan districts also in Guzerat, very common near Poona in hedges and open situations, absent from N. Kanara and the Southern Mahratta country. Flowers during the R. S. July-Sept. Stems 4″-6″ in diameter. Bark smooth, lenticellate. The latex which is abundant in the stems and particulary so at the base of the follicles contains rubber of

excellent quality. *Cryptostegia* is now being introduced into the Rubber plantations of the Wynaad and Malabar.

3. CRYPTOLEPIS, Br.

Glabrous twiners. Leaves opposite, usually pale or glaucous beneath. Flowers in lax, slender, axillary or terminal, few-flowered, peduncled, bracteate cymes. Calyx 5-divided. Corolla-tube short, cylindric or campanulate; lobes linear, twisted to the left; corona corolline, of 5, fleshy connivent scales on and included within the tube. Stamens with free or slightly connate filaments inserted near the base of the corolla-tube; anthers triangular, short, adhering by their bases to the broadly conical style-table; pollen-masses granular, in pairs in each cell; appendages oblong. Follicles lanceolate, divaricate, smooth. Seeds comose.

Fig 406. Cryptolepis Buchanani, R. & S.

C. Buchanani, Roem. & Sch. Syst. IV, 409; Fl. Br. I. 4, 5; Brandis For. Fl. 330; Dalz. & Gibs. Bomb. Fl. 148. *Karanta, setakavali, bhut-gundi,* Vern.; *Kurbuntun-balli* K.

A twining, glabrous shrub with white, smooth branches. Leaves ovate or elliptic-oblong, 3″-6″ by 1·5″-3″, acute, mucronate or apiculate at the apex, acute at the base, thin, green, shining above, white beneath; lateral-nerves slender, numerous, parallel, nearly at right angles to the midrib, looping within the margin, dark-coloured, distinct beneath; petioles about ·25″ long. Flowers in axillary or terminal, many-flowered, panicled cymes 1″-2″ long; bracts ·1″ long, ovate acute, thin, persistent. Calyx 5-divided to the base; lobes about ·1″ long, ovate-obtuse with membranous margins and with 5 short, flat scales inside at the base. Corolla tubular, ·5″ long, pale greenish-yellow; tube ·1″ long; lobes linear-lanceolate; coronal-scales clavate. Follicles linear-lanceolate, 3″-4″ long by ·25″-·5″ thick, straight, divaricate, smooth; seeds oblong, black; coma silky, about 1″ long.

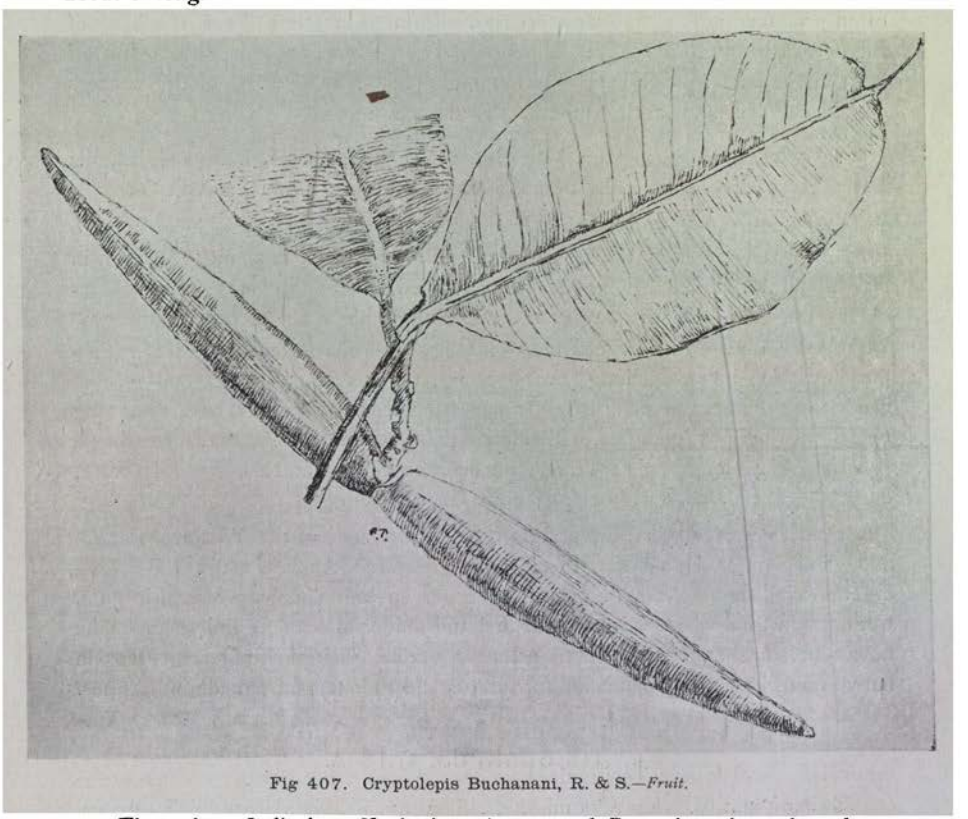

Fig 407. Cryptolepis Buchanani, R. & S.—*Fruit.*

Throughout India from Kashmir to Assam and Burmah and southwards to Ceylon. Widely distributed in monsoon-forest also common in hedges through-

out the presidency. Fl. June-Aug. Fr. C. S. Outer-bark dark-brown papery, exfoliating in large or small sheets; inner-bark white, with much milky juice. In North Kanara the leafy stems are tied on poles near threshing floors before the paddy is brought home from the rice stacks. The wood is used in native medicine in Ceylon.

4. PERIPLOCA, Linn.

Glabrous erect or twining shrubs, sometimes leafless. Leaves opposite, lanceolate, minute or wanting. Flowers greenish externally, purplish within, in lax, axillary or terminal cymes. Corolla rotate; lobes 5, bearded within, longer than the tube. Corolla corolline, of 5 thick scales connate into a 10-lobed ring, often produced in long filiform processes. Stamens inserted above the base of the corolla within the corona; filaments short, flat, free; anthers with a tuft of hairs at the back; pollen-masses in fours, glandular; appendages of the carriers dilated. Follicles cylindric, smooth. Seeds comose.

P. aphylla, Dcne. in Jacq. Voy. Bot. 109 t. 116; Fl. Br. I. 4, 12; Brandis For. Fl. 330; Cooke Fl. Pres. Bomb. 2, 148. *Barrara, ransher, barai,* Vern.

A glabrous erect shrub with long slender stems and branches. Leaves when present ovate, ·25″ long, thick, nerveless. Flowers fragrant, about ·5″ across, in short, lateral, rounded, often opposite, peduncled, bracteate cymes; bracts ovate-oblong with membranous margins and breaking off about the middle. Calyx ·1″ long; lobes obtuse with membranous margins. Corolla greenish outside, dark-purple within; lobes ·25″ long, ovate-oblong, reflexed, densely bearded on the inside near the apex, corona-lobes transversely truncate at the base and long filiform at the apex, glabrous. Filaments glabrous; anthers hairy at the back. Follicles 3″-4″ long by ·25″ thick, on short, thick peduncles, woody, terete, divaricate; seeds narrowly oblong; coma about 1″ long.

South Persia, Arabia, Egypt, Afghanistan, dry zone of the Western Punjab and Sind; outer Himalayas, up to 3500. Fl. Mch.-Apl. Usually a leafless, erect shrub; stems 6′-10′ long, with striate, green branches covered with gum. Common in Sind where it is used for fuel and fodder for camels and goats. The flower-buds are sweet and eaten as a vegetable. The milky juice serves in native medicine as an application for tumors and the stems are made into ropes.

5. TOXOCARPUS, W. & A.

Twining shrubs. Leaves opposite. Flowers small, in axillary, dichotomous, panicled cymes. Calyx minute; lobes obtuse. Corolla salver-shaped; tube short; lobes narrow, recurved, overlapping to the left; coronal-scales minute,

dorsally flattened, adnate to the column. Filaments connate; anthers small, often inappendiculate; pollen-masses 2 in each cell, pendulous, minute, waxy. Stigma produced in a long beak. Follicles spreading smooth. Seeds comose.

T. Kleinii, Wgt. & Arn. Contrib. 61; Fl. Br. I. 4, 14; Cooke Fl. Pres. Bomb. 2, 149; Grah. Cat. Bomb. Pl. 122.

A twining shrub with long rufous-hairy stems; young parts and inflorescense red-pubescent. Leaves elliptic, 2″-4″ by 1″-2″, lanceolate, shortly acuminate at the apex, acute at the base, thinly coriaceous, glabrous above, more or less red-pubescent beneath; lateral-nerves about 5 pairs, slender; petioles ·3″ long, pubescent. Flowers in rusty-pubescent, paniculate, axillary cymes; pedicels 0-·5″ long, pubescent; bracts linear-oblong, obtuse. Calyx-lobes ·12″ long, obtuse or subacute with scarious margins. Corolla quite glabrous, ·25″ long; tube ·15″ long; lobes lanceolate, recurved. Stigmatic-beak long, slender. Follicles about 5″ long by ·25″ thick, tapering to the apex and slightly curved; seeds ovate-lanceolate; coma about ·1″ long

Hills of the Deccan peninsula from the Konkan southwards, very rare in this presidency.

6. GENIANTHUS, Hook. f.

Twining shrubs. Leaves opposite. Flowers small, in axillary, subsimple, branched cymes. Calyx minute; lobes obtuse. Corolla-tube short; lobes valvate, spreading and recurved, villous or bearded on the inner face; corona of five scales, adnate to the column. Staminal-column minute; pollen-masses 2 in each cell, minute, waxy. Stigma sessile, capitate or long and slender. Follicles terete, slender. Seeds comose.

G. laurifolius, Hook. f.; Fl. Br. I. 4, 16; Cooke Fl. Pres. Bomb. 2, 149; *Toxocarpus crassifolius*, Dalz. & Gibs. Bomb. Fl. 148.

A twining shrub with obtusely quadrangular, glabrous branches, rough with raised lenticels. Leaves elliptic, 2·5″-3·5″ by 1·2″-1·75″, acuminate at the apex, acute at the base, subcoriaceous, glabrous shining above, pale beneath; lateral-nerves 6-8 pairs, parallel, slender, distinct beneath; petioles ·5″-·75″ long. Flowers small, whitish, in many-flowered, axillary, more or less rufous-hairy, branched, peduncled cymes; peduncles often fascicled, ·5″-1·5″ long; branches short, mostly at the ends of the peduncles; pedicels 0-·1″ long, rufous-pubescent; bracts minute, ovate-acute, densely rufous-hairy. Calyx lobes ovate, acute or subobtuse, rufous-pubescent, one fourth to half as long as the corolla-lobes. Corolla-lobes ovate, strap-shaped, about ·1″ long, obtuse, reflexed, glabrous outside, densely white-hairy within; tube nearly obsolete. Follicles slender, terete,

3″-5″ long by ·25″ thick, curved and pointed, not beaked, often pustular; seeds linear-lanceolate, flattened, dark-brown; coma about 1″ long.

Sikkim Himalaya in hot valleys, Konkan and North Kanara, common in rain-forest near the Nilkund and Gairsoppah ghàts. Fl. Oct.-Dec. Fr. H. S.

7. CALOTROPIS, Br.

Large erect shrubs. Leaves opposite, broad, subsessile. Flowers large in umbelliform, pedunculate, lateral cymes. Sepals glandular within. Corolla-tube broad; lobes ovate, valvate; corona of five, compressed, fleshy, dorsally spurred appendages radiating from a large staminal-column. Anther-tips broad, membranous, inflexed on the stigma; pollen-masses 10 in pairs, waxy, pendulous, attached to the carriers by slender caudicles. Stigma depressed, 5-angled or lobed. Follicles broad, ovoid, short, oblique. Seeds comose.

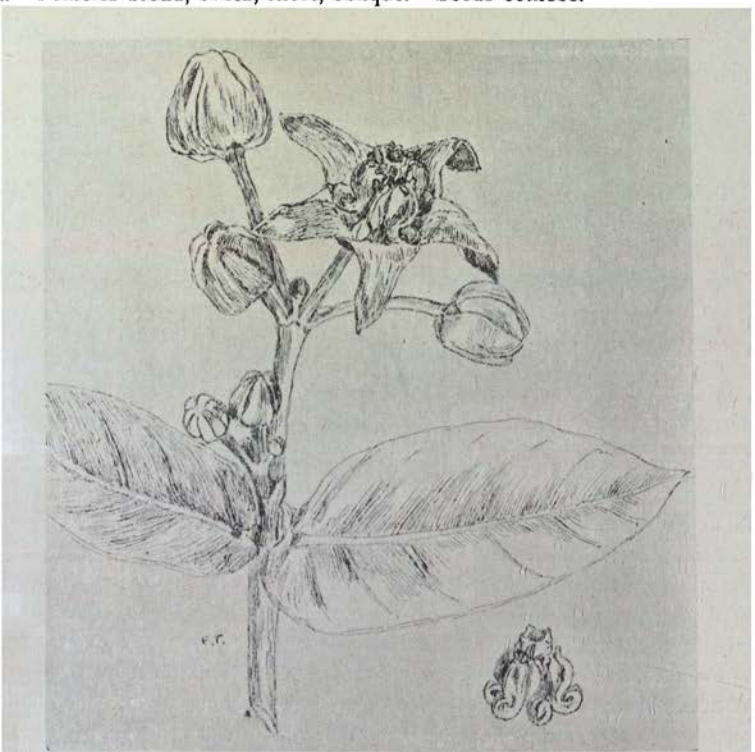

Fig 408. Calotropis gigantea, R. Br.

Flower-buds, ovoid, angled. Coronal-appendages rounded at the apex, not longer than the staminal-column ... ... 1. C. gigantea.

Flower-buds hemispherical, not angled. Coronal-appendages acute at the apex, longer than the staminal-column ... ... 2. C. procera.

1. C. gigantea, Br. in Hort. Kew Ed. 2, 11, 78; Fl. Br. I. 4, 17; Dalz. & Gibs. Bomb. Fl. 149; Brandis For. Fl. 338; Cooke Fl. Pres. Bomb. 2, 151; Gamble Ind. Timb. 491. *Madar, mudar,* M.; *Arka, akari, rowi,* Vern.

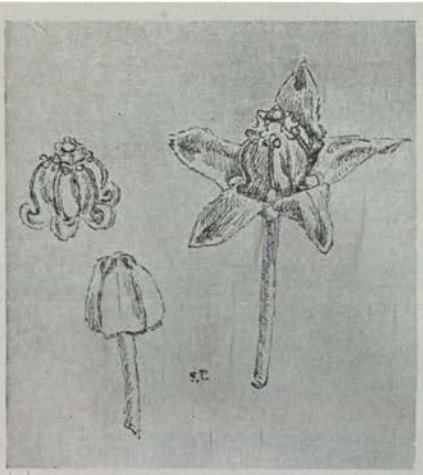

Fig 409. Calotropis gigantea, R. Br.—*Flowers.*

A large usually much-branched often gregarious shrub; branchlets stout, covered with white, adpressed, cottony tomentum. Leaves obovate or elliptic-oblong, 4″-8″ by 1·5″-4″, acute or shortly acuminate at the apex, sessile or nearly so and narrowly cordate often amplexicaul at the base. Flowers large, purplish, sometimes white, 1·5″-2″ across, inodorous in umbellate, axillary or terminal corymbose cymes about as long as the leaves; pedicels 2″-3″ long, covered with woolly pubescence; bracts ovate-lanceolate, scarious; buds ovoid. Calyx divided to the base into 5, white, ovate, acute sepals each ·25″ long. Corolla-tube broadly-campanulate; lobes spreading or reflexed, twisted at the ends when old; coronal-appendages broad, sinuate, obtusely 2-auricled below the rounded apex which is lower than the staminal-column. Follicles ventricose, boat-shaped, about 3·5″ long, thick, fleshy, green; seeds broadly obovate, flattened, ·25″ by ·2″, minutely tomentose, brown; coma about 1·5″ long.

Tropical India also in the Himalaya ascending to 3000′, Burmah and Ceylon. Malay peninsula and Archipelago; throughout the presidency in dry, waste places, very common. Fl. throughout the year. A large shrub. Bark yellowish-white, corky with vertical cracks. Wood soft, white. Pores single or in small groups. Medullary rays fine, short, alternating with long very fine rays.

One of the most, common widespread and conspicuous plants in India; it grows on nearly all kinds of soil from the sandy sea-coast inland. The stems

are full of acrid milky juice which as well as the flowers, powdered root-bark and leaves are much used in native medicine, principally in fever and dysentery cases. A kind of inferior gutta-percha is extracted from the milky juice. The bark-fibre is stronger than flax with the lustre and softness of silk; it is however rather difficult to extract. The floss from the seed-coma mixed with cotton and other fibres was formerly woven into fabrics. This industry is now dead. The wood is used for native tooth-brushes and is converted into charcoal used for making gunpowder both in Guzerat and the Deccan.

2. C. procera, R. Br. in Ait. Hort. Kew Ed. 2, 11, 78; Fl. Br. I. 4, 18; Dalz. & Gibs. Bomb. Fl. 149; Brandis For. Fl. 331; Cooke Fl. Pres. Bomb. 2, 152; Gamble Ind. Timb. 491. *Lalmandar, tambara, ak,* M.

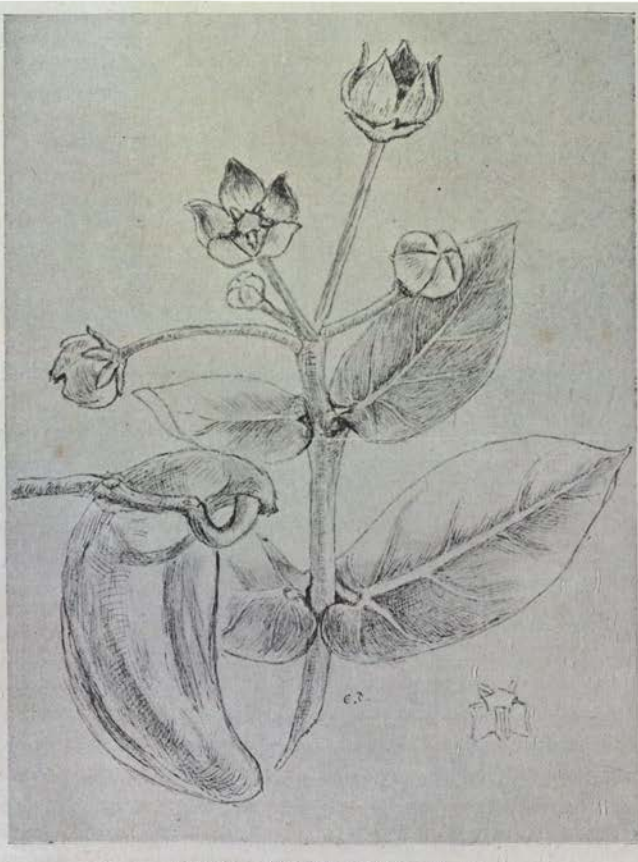

Fig 410. Calotropis procera, R. Br.

A large shrub similar in habit and appearance to *C. gigantea*; young parts hoary. Leaves obovate or obovate-oblong, 2·25″-6″ by 1·75″-3·25″, subsessile, acute or very shortly acuminate at the apex, narrow and cordate at the base. Flowers about 1″ across, pale outside, purplish within, strongly scented, in umbellate, axillary or terminal cymes; bracts linear-acute, white-woolly outside, glabrous within; pedicels 2″-3″ long, white-woolly; buds depressed-globose. Calyx divided to the base; sepals ·2″ by ·1″, ovate-acute, glabrous. Corolla-tube broadly campanulate; lobes ¾ the corolla, ovate-acute, erect; coronal-appendages broad, equal to or exceeding the staminal-column, straight, obliquely truncate and bifid at the apex. Follicles and seeds nearly as in *C. gigantea*.

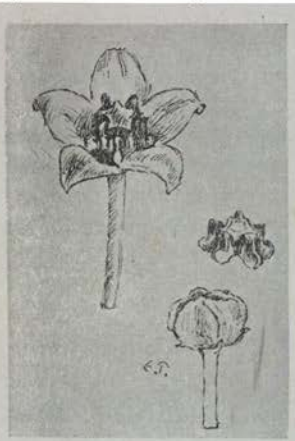

Fig 411. Calotropis procera, R. Br. *Flower.*

Western and Central India from Sind (where it is abundant) and the Punjab to Mysore; common in the dry parts of the Belgaum district, often associated with *C. gigantea*. Bark and wood similar to those of *C. gigantea*. Wood soft, light, yellowish-white or grey. Pores small and medium-sized, single or in radial lines of 2-4 pores. Medullary rays numerous, fine and broad mixed. Bark used in Sind for halters, lines and nets. Fl. and Fr. throughout the year.

8. DÆMIA, Br.

Twiners. Leaves opposite, cordate. Flowers medium-sized, in axillary, peduncled cymes; pedicels filiform. Calyx 5-partite, glandular inside. Corolla green; tube short; lobes large, broad, overlapping to the right; corona double, consisting of an outer, annular, 5-10-crenate or lobed membrane and 5 compressed scales, adnate to the anthers and spurred behind with long subulate tips. Staminal-column arising from the mouth of the corolla-tube; anthers erect with inflexed tips; pollen-masses in pairs in the pollen carriers, pendulous, waxy. Style-apex exserted. Follicles softly echinate. Seeds comose.

D. extensa, Br. in Mem. Wern. Soc. 1, 50; Fl. Br. I. 4, 20; Dalz. & Gibs. Bomb. Fl. 150; Cooke Fl. Pres. Bomb. 2, 155. *Utarni*, M.

A twining shrub; stems hairy containing much milky juice, more or less fœtidly smelling when bruised. Leaves broadly ovate, 2″-4″ by 1·5″-3·5″, acuminate at the apex, deeply cordate at the base with the basal-lobes rounded and incurved, membranous, pubescent or glabrescent above, densely tomentose

beneath and ciliate on the margins; petioles pubescent, ·75″-2·5″ long. Flowers ·5″ across, greenish-white, in long, racemed, axillary cymes. Calyx divided to the base; sepals ·3″ long, ovate-lanceolate, acute. Corolla-tube short, narrow-campanulate; lobes spreading, ovate-oblong, ciliate on the margins; corona double; corolline membranous, subquadrate, truncate; staminal white, acutely spurred and with long slender flattened horns often twisted together curving over the staminal-column. Follicles pear-shaped, beaked, about 2″ long, covered with long, soft, grey, irregular, tomentose spines; seeds yellow-brown, ·25″ long, ovate, flattened on one side, black-spotted, upper-edge crenate; coma about 1·5″ long.

Tropical and extra-tropical India from the North-Western Himalaya to Lower Bengal, Burmah and Ceylon; throughout the dry districts of the Deccan also in the Konkan often in hedges and near villages, common in the Dharwar district. Flowers apparently throughout the year. Twining shrub, yielding a fine strong fibre recommended as a substitute for flax, also used in native medicine. Scarcely a forest species.

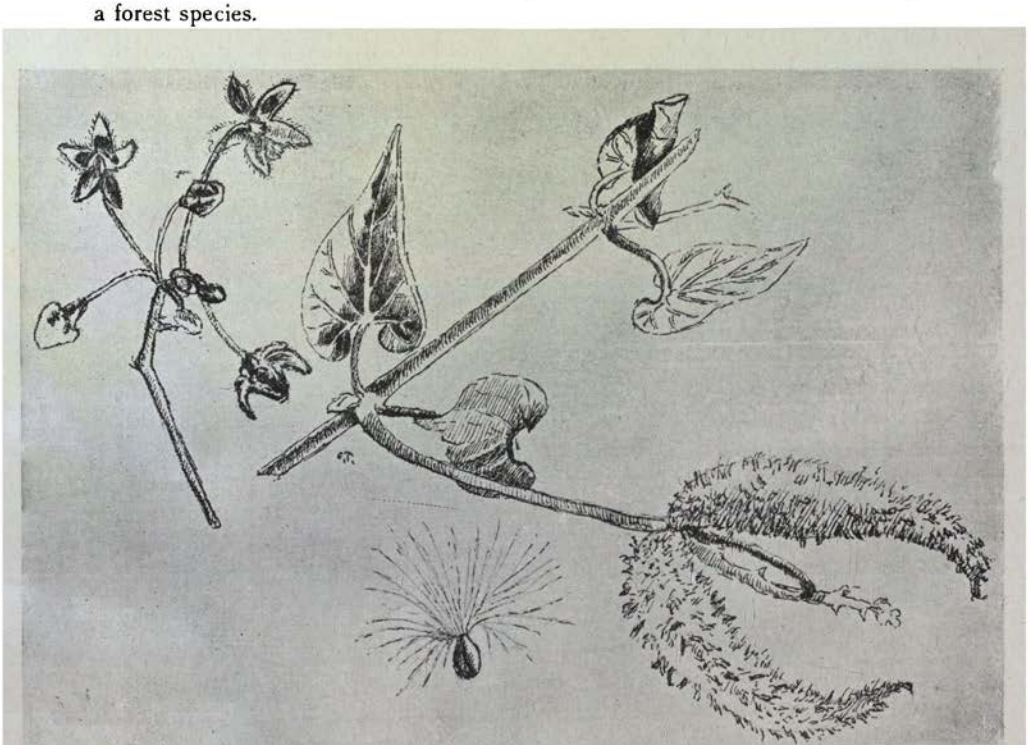

Fig 412. Dæmia extensa, Br.

9. HOLOSTEMMA, Br.

Twining glabrous shrubs. Leaves membranous, cordate. Flowers large, purple, in axillary, few-flowered, peduncled cymes. Calyx 5-partite; lobes ovate, eglandular. Corolla rotate; lobes thick, overlapping to the right; corona annular, 10-lobed, fleshy. Anthers large, horny, shining, cohering in a 10-winged column; pollen-masses 1 in each cell, linear, falcate, compressed, pendulous on a long, black caudicle. Stigma 5-winged, included. Follicles short, thick, smooth, acute. Seeds comose.

H. Rheedei, Wall. Pl. As. Rar. 11, 51; Fl. Br. I. 4, 21; Dalz. & Gibs. Bomb. Fl. 148; *H. Rheedianum*, Spreng. Syst. 851; Cooke Fl. Pres. Bomb. 2, 156. *Tultuli, shidori, shiroli, dudurli,* M.

A large twining shrub; stems and branches cylindrical, striate, glabrous. Leaves ovate-oblong, 3″-5″ by 1·5″-3″, acuminate at the apex, deeply and broadly cordate at the base, membranous, dark-green, glabrous above, paler and usually glabrescent beneath; lateral-nerves about 4 pairs, slender, inarching; petioles 2″-3″ long. Flowers 1″-1·5″ across, fragrant, purple within, pale-pink on the outside; peduncles 1″-2″ long. Calyx divided to the base; lobes ·2″ long, broad-ovate, obtuse, glabrous. Corolla rotate; lobes thick, ovate, ·5″ long, divided $\frac{2}{3}$ of the way down; corona a fleshy, truncate ring, 1″ high, adnate to the base of the staminal-column. Anthers large, winged; tips membranous, inflexed over the stigma; pollen-masses compressed, linear-clavate pendulous from the carriers on black caudicles. Follicles 4″-5″ long by ·25″ thick, cylindrical, bluntly-pointed, smooth; seeds oblong, flat, not crenate; coma about 1″ long.

Tropical Himalaya from Sirmore to Sikkim up to 3-6000′, Western peninsula from the Konkan southwards, in the moist forests of the Konkan and North Kanara also often in hedges. Fl. July-Aug. Fr. C. S. Flowers edible. Root used as an application for ophthalmia. Bark yields a fibre.

10. CYNANCHUM, Linn.

Shrubs or herbs, erect or twining. Leaves opposite, usually broad, cordate. Flowers small, green, in axillary cymes. Calyx 5-partite. Corolla rotate or campanulate; lobes valvate or overlapping to the right; corona adnate to the base of the column, cupular or campanulate, toothed, with or without scales or tubercles on the inner face. Anthers with membranous, inflexed tips, sessile, or stipitate; pollen-masses 1 in each cell not compressed, pendulous, waxy. Stigma flat, umbonate or apiculate. Follicles terete or 2-winged, smooth. Seeds comose.

Leaves glaucous beneath. Follicles winged ... 1. C. Callialata.

Leaves not glaucous beneath. Follicles terete, not winged ... ... 2. C. pauciflorum.

1. C. Callialata, Ham. in Wgt. Contrib. 55; Fl. Br. I. 4, 24; Cooke Fl. Pres. Bomb. 2, 157.

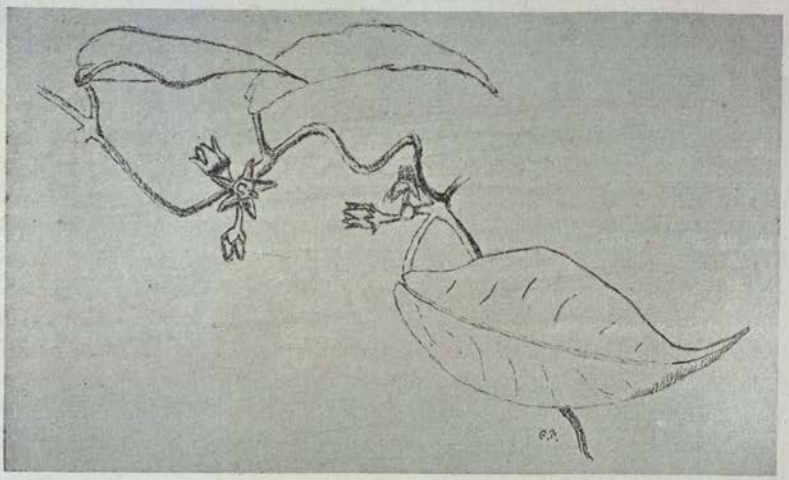

Fig 413. Cynanchum Callialata, Ham.

A twining shrub; branchlets terete, striate and usually glabrous. Leaves ovate or elliptic-oblong, 2″-3″ by ·75″-1·5″, acuminate at the apex, contracted and shallowly cordate at the base, dark-green above, glabrous and glaucous beneath; thinly subcoriaceous; petioles ·75″ long, often with broad, leafy, stalked stipules in the axils. Flowers ·3″ in diameter, greenish, in short, axillary, umbellate cymes about as long as the petioles. Calyx glabrous, divided to the base; sepals ·1″ long, ovate-acute. Corolla divided to near the base; lobes ·25″ long, linear-acute, spreading, often deflexed, hard; corona white, membranous, campanulate, lobed and toothed, shorter than the corolla. Anther-tips orbicular, membranous; pollen-masses oblong, attached to the carriers by distinct caudicles. Follicles lanceolate, 2·5″-3″ long by ·25″ thick at the base, divaricate or simple, narrowly 2-winged, smooth; seeds ·3″ long, broadly-ovate, brown, glabrous, margined; coma about ·75″ long.

Behar, Burmah, Western peninsula from the Konkan to Travancore in monsoon and rain-forest along the ghâts, also in the dry deciduous Deccan forests on trap, common in rain-forest near the Nilkund ghât of North Kanara. Fl. Oct.-Dec. Fr. Jan.-Feb.

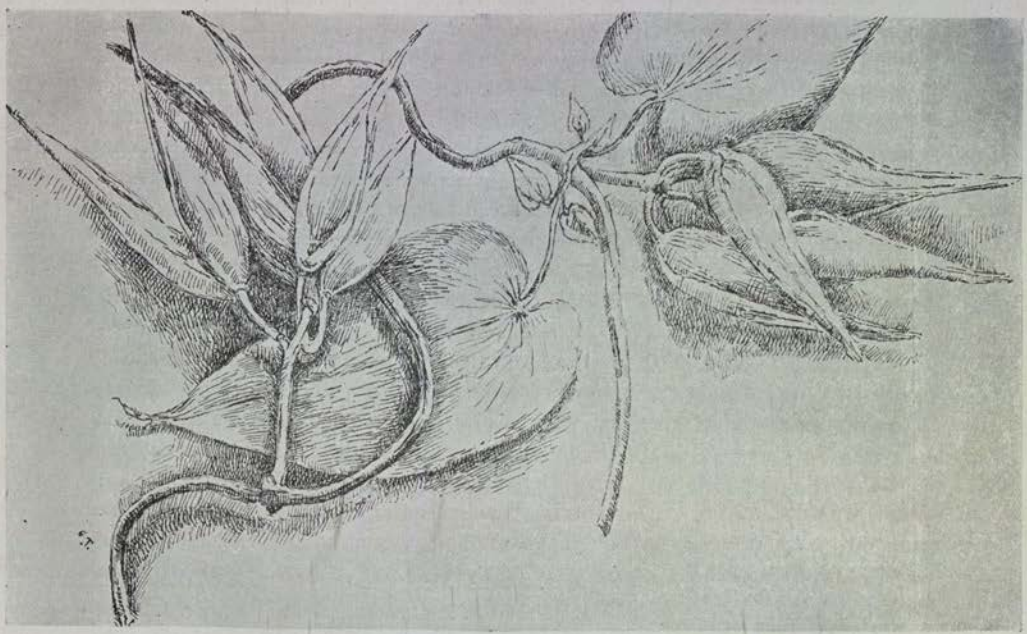

Fig 414. Cynanchum Callialata, Ham.—*Fruit.*

2. C. pauciflorum, Br. in Mem. Wern. Soc. 1, 45; Fl. Br. I. 4, 23; Dalz. & Gibs. Bomb. Fl. 148; Cooke Fl. Pres. Bomb. 2, 157.

Western peninsula from the Konkan southwards to Travancore and Ceylon (Central Provinces) in monsoon and rain-forest along the ghâts also in the dry Deccan on trap. Fl. C. S. A rare herbaceous twiner.

11. SARCOSTEMMA, Br.

Leafless trailing or twining jointed shrubs with pendulous branches. Flowers small, white in sessile, terminal umbels. Calyx 5-partite. Corolla rotate; lobes overlapping to the right; corona double; outer-corona membranous, cup-shaped or shortly lobed, alternate lobes with large, erect, fleshy processes; inner-corona adnate to the back of the anthers. Staminal-column short, from base of corolla; anthers with membranous, inflexed tips; pollen-masses one in each cell, slender, pendulous, waxy. Stigma conical, fusiform. Follicles smooth; seeds comose.

S. brevistigma, Wight and Arnott's Contrib. 59; Fl. Br. I. 4, 26; Dalz. & Gibs. Bomb. Fl. 149; Cooke Fl. Pres. Bomb. 2, 158. *Somvel,* M.

Stems cylindrical as thick as a goose-quill, green, glabrous, striate; joints 4″-8″ long, glabrous, covered with pale-coloured dots. Flowers pale greenish-white, middlesized, sweet-scented in sessile, many-flowered umbels; buds 5-angled, obtuse; bracts minute, linear; pedicels ·5″ long, thickened upwards, puberulous. Calyx divided to the base; sepals ·05″ long, ovate, glandular at the base inside and with membranous margins. Corolla campanulate, ·5″ across, divided nearly to the base; lobes ovate-oblong, obtuse; corona cup-shaped, 5-angled; inner horns thick, smooth white, adnate to the back of the anthers. Staminal-column very short; pollen-masses compressed, clavate; caudicle very short. Follicles lanceolate about 4″ long by ·3″ thick, straight, slightly diverging when two together; seeds flattened, ovate, ·25″ long; coma ·75″ long.

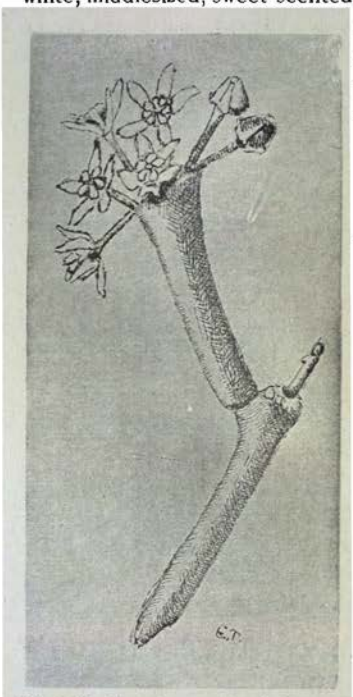

Fig 415. Sarcostemma brevistigma, W. & A.

Bengal, Burmah and the Western peninsula; throughout the Deccan in stony places. Fl. June-Nov.

S. Stocksii, Hook. f.; Fl. Br. I. 4, 27; found in Sind and **S. intermedium,** Dcne.; Fl. Br. I. 4, 27; Dalz. & Gibs. Bomb. Fl. 27. *Phok,* M.

Dry districts of the Deccan, Poona, etc. Guzerat, Gadag taluka (Dharwar). Fl. July-Sept. Both closely allied to *S. brevistigma,* are not strictly forest species and scarcely worth including in this work.

12. GYMNEMA, R. Br.

Twining shrubs. Leaves opposite. Flowers small in crowded, axillary or interpetiolar, umbellate cymes. Calyx 5-partite. Corolla rotate, campanulate or urceolate; lobes thick, overlapping to the right in bud; corona in the throat of the corolla of 5 fleshy, villous, double ridges alternating with the lobes. Anthers terminating with a membranous appendage; pollen-masses in pairs, erect. Stigma large conical, clavate or capitate, exserted. Follicles slender or turgid, glabrous; seeds comose.

Pubescent. Leaves small, obovate, acute ...	1.	G. sylvestre.
Glabrous or nearly so. Leaves large, coriaceous, ovate-oblong	2.	G. montanum.

1. **G. sylvestre,** Br. in Mem. Wern. Soc. 1, 33; Fl. Br. I. 4, 29; Dalz. & Gibs. Bomb. Fl. 151; Cooke Fl. Pres. Bomb. 2, 160. *Kawali, kali-kardori, vakhande,* M.

A large twining shrub; branchlets and young parts densely yellow-tomentose or softly pubescent. Leaves ovate-elliptic, 1·25″-1·75″ by ·6″-1″, acute or shortly acuminate at the apex, rounded or cordate at the base, thin, more or less pubescent on both sides, particularly on the nerves beneath; lateral-nerves 3-4 pairs, inarching; petioles ·25″-·4″ long, densely pubescent. Flowers small, pedicelled, in pedunculate, axillary cymes, shorter than the petioles; peduncles pubescent or tomentose; pedicels ·25″ long, slender. Calyx divided to the base; sepals ·08″ long, obtuse, ciliolate. Corolla yellow, ·15″ across; tube campanulate; lobes glabrous, ovate, spreading, recurved about as long as the tube; corona of 5, fleshy, double-ridged processes inserted on the corolla-throat protruding beyond the mouth of the corolla and produced downwards. Staminal-column small. Style thick; apex much exserted, pearly-white. Follicles lanceolate, usually single, 2·5″-3″ long by ·2″ thick, smooth shining; seeds ·5″ long with a thin marginal-wing, brown, glabrous; coma ·75″ long.

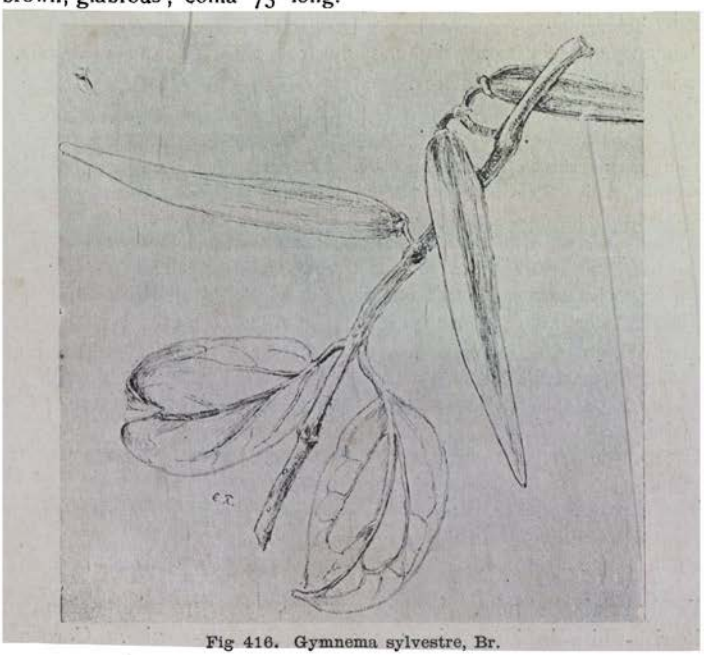

Fig 416. Gymnema sylvestre, Br.

Central and Western peninsula from the Konkan to Travancore; throughout the Presidency in monsoon-forest, common in hedges in the Dharwar District,

also at Mahableshwar and near the coast at Karwar, North Kanara. Fl. June-Aug. Fr. Oct.-Nov.

The leaves of this plant when chewed remove the taste of bitters (quinine, etc.) also partially that of sweets like sugar. "The stems are used in native medicine in Ceylon." Trimen.

2. G. montanum, Hook. f.; Fl. Br. I. 4, 31; Cooke Fl. Pres. Bomb. 2, 161; *Bidaria elegans*, Dalz. & Gibs. Bomb. Fl. 151.

A glabrous or nearly glabrous twining shrub with smooth, slender branchlets. Leaves oblong or ovate-oblong, 3″-4·5″ by 1·5″-2″, acute or acuminate at the apex, rounded at the base, thinly coriaceous, glabrous; petioles about ·5″ long. Flowers greenish-yellow in corymbose, at length racemose cymes; peduncles pubescent, shorter than the petioles; pedicels slender, ·2″ long; bracts minute, ciliate. Calyx divided to the base; sepals linear-oblong, ·2 long, reflexed, ciliate. Corolla-tube about ·1″ long, narrowly campanulate; lobes oblong, about as long as the tube; coronal-processes adnate to the corolla-tube, with the apices not prolonged above the sinus, margins densely hairy. Follicles acuminate, 3″ long by ·25″ thick.

Deccan peninsula on the higher ghâts from the Konkan southwards. A rare species in the Bombay presidency.

MARSDENIA, R. Br.

Usually twining shrubs. Leaves opposite. Flowers medium-sized or small, in umbelliform axillary cymes. Calyx 5-partite. Corolla campanulate, urceolate or salver-shaped; lobes overlapping to the right; coronal-scales 5, sometimes auriculate, erect, adnate to the back of the anthers. Anthers erect with membranous appendages incumbent on the stigma; pollen-masses 10, in stipitate pairs, erect. Stigma depressed, obtuse, conical or beaked. Follicles lanceolate or poniard-shaped. Seeds comose. Mr. N. E. Brown (Dyer Fl. Trop. Africa 4, 417) includes *Dregea* in this genus. I have followed the Fl. Br. I. and keep them separate.

M. tinctoria, Br. in Mem. Wern. Soc. 1, 30; Fl. Br. I. 4, 34; Brandis For. Fl. 332; *Asclepias tinctoria*, Roxb. Fl. Ind. 2. 43.

Eastern Bengal, Sikkim, up to 3000′. Burmah; cultivated in the Deccan. Fl. hot and rainy seasons.

A large twining shrub. Yields a very strong, valuable, tenacious fibre. The leaves also yield indigo.

13. PERGULARIA, Linn.

Woody twining shrubs. Leaves opposite. Flowers middle-sized, greenish or yellowish-white in interpetiolar cymes. Calyx 5-partite. Corolla salver-shaped; lobes oblong, overlapping to the right; coronal-scales large, membranous, adnate to the back of the anthers, erect, simple or transversely bifid.

Anthers erect, terminating in membranous appendages conniving over the stigma; pollen-masses erect, or sub-cylindrical, clavate. Stigma pentagonal, umbonate or capitate, longer than the anther-cells. Follicles ventricose-lanceolate, smooth. Seeds comose.

P. pallida, Wight. & Arn. Contrib. 42; Fl. Br. I. 4, 38; Brandis For. Fl. 334; Cooke Fl. Pres. Bomb. 2, 164; Gamble Ind. Timb. 493.

A large twining shrub; branches terete, pubescent. Leaves broadly ovate or obovate, 2″-4″ by 1·5″-2·75″, acute or acuminate at the apex, rounded to deeply cordate at the base, membranous, dark-green, glabrescent above, paler and pubescent particularly on the nervation beneath; lateral-nerves 5-6 pairs, lowest 2 basal; petioles 1″-1·5″ long, pubescent. Flowers middle-sized, pale-yellow, pedicelled, in axillary, peduncled, umbellate cymes; peduncles pubescent, about ·25″ long, rather stout; pedicels slender, ·5″ long, pubescent. Calyx divided to the base; sepals ovate, subacute, ·25″ long, pubescent. Corolla-tube ·25″ long, inflated and slightly hairy at the base inside; lobes, linear, ·5″ long, acute, glabrous; coronal-scales linear, erect, membranous with broad points connivent over the stigma. Anther-appendages long, membranous, subacute; pollen-masses clavate, erect, on short caudicles. Stigma stout, not exserted. Follicles 3″-4″ long by ·5″ thick, lanceolate, tapering to a point, smooth; seeds ovate, ·3″ long, glabrous, pale-brown, margined; coma 1″ long.

Tropical Himalaya from Murree (5000′) eastwards to Sikkim and southwards to Bombay and Central India. In the plains of the Deccan and in the scrub jungles on the stony hills near Dharwar. Fl. July-Aug.

P. odoratissima, Wgt. Contrib. 43 (not of Sm.); Dalz. & Gibs. Bomb. Fl. Suppl. 54. *Cowslip, West Coast* or *Primrose-Creeper*. *Kunja-luta*, Vern. and *P. minor*, Andr. Bot. Rep. t, 184, with sweetly-scented flowers are both commonly cultivated in gardens throughout the presidency.

14. COSMOSTIGMA, Br.

A twining shrub. Leaves opposite. Flowers small, greenish, in axillary, racemose cymes. Calyx 5-partite. Corolla rotate; lobes overlapping to the right; coronal-scales adnate to the base of the anthers, erect, broad, membranous, truncate or 2-fid. Staminal-column short; anthers appendiculate with a round inflexed membrane; pollen-masses obovoid, waxy, erect, caudicles long, flexuous. Stigma broad, flat, 5-angled. Follicles large, linear-oblong, obtuse, smooth. Seeds comose.

C. racemosum, Wight Contrib. 42; Fl. Br. I. 4, 46; Dalz. & Gibs. Bomb. Fl. 151; Cooke Fl. Pres. Bomb. 2, 167. *Jati*, M.

A twining shrub; branches terete, glabrous. Leaves broadly ovate, 3″-5″ by 2″-3″, acuminate at the apex, acute, rounded or cordate at the base, membranous; lateral-nerves 5-6 pairs, lower 2 basal; petioles 1″-1·5″ long. Flowers small, greenish in axillary, peduncled cymes; peduncles as long as the petioles; pedicels ·3″-·05″ long, shorter upwards and arranged spirally round the rachis; bracteoles minute. Calyx divided nearly to the base; lobes ovate-obtuse with membranous margins. Corolla ·3″ in diameter, deeply divided; lobes fleshy, brown-speckled; corona of 5, 2-fid, membranous, erect scales. Pollen-masses clavate, erect, attached by long, slender caudicles to the carriers. Stigma 5-angled, slightly umbonate. Follicles about 6″ long by 1·5″ thick, bluntly pointed, smooth; seeds broadly ovate about 1″ long; coma 1″ long.

Silhet, Chittagong and Western ghâts from the Konkan southwards to Ceylon; throughout the Konkan and North Kanara, often in hedges. Fl. June-Aug. Fr. C. S.

15. TYLOPHORA, R. Br.

Slender twining rarely erect undershrubs. Leaves opposite. Flowers small or minute in lateral, long-peduncled or sessile umbels or racemes. Calyx 5-partite. Corolla rotate, deeply 5-lobed; coronal-lobes of 5, fleshy tubercles adnate to the base of the staminal-column. Staminal-column very short; anthers erect with a membranous, inflexed tip; pollen-masses one in each cell, minute, globose affixed in pairs to the carriers by slender caudicles. Stigmas 5-angled, depressed. Follicles smooth, long-pointed, tapering, sometimes winged. Seeds comose.

Slender, suberect, short-stemmed under-shrubs ... 1. T. fasciculata.
Twining under-shrubs.
Flowers small; coronal-lobes without free points... 2. T. Dalzellii.
Flowers twice as large (·25″ across); coronal-lobes free, cuspidate at the apex ... ... 3. T. asthmatica.

1. T. fasciculata, Ham. in Wight Contrib. 50; Fl. Br. I. 4, 40; Dalz. & Gibs. Bomb. Fl. 151; Cooke Fl. Pres. Bomb. 162. *Bhindodi,* Vern.

An erect short slender shrub with one or more pubescent stems from the roots sometimes twining at the tips. Leaves ovate or lanceolate, 1″-2″ by ·6″-1·25″, acute or shortly acuminate at the apex, rounded at the base, and unequal-sided rather closely arranged on the stems, diminishing in size upwards, membranous, glabrous above, more or less pubescent on the nerves beneath; basal-nerves 3-5, prominent beneath; petioles ·25″-·5″ long, pubescent. Flowers small, ·12″

across, in lateral, umbelliform, peduncled cymes; peduncles ·25″ long, slender; pedicels ·25″ long, filiform; bracts minute, subulate. Calyx minute, pubescent; sepals linear-acute. Corolla deeply divided; lobes ·1″ long, broadly ovate-acute, veined; corona of 5, globose, fleshy lobes from the staminal-column. Anther-tips membranous, projecting over the 5-lobed stigma. Pollen-masses minute. Follicles fusiform, 1·5″-2·5″ long by ·5″ thick at the base, with a glabrous, thick pericarp and on slender stalks; seeds ovate, ·25″ long; coma ·75″ long.

2. T. Dalzellii, Hook. f.; Fl. Br. I. 4, 43; Cooke Fl. Pres. Bomb. 2, 163; *T. carnosa,* Dalz. & Gibs. Bomb. Fl. 150 (not of Wight).

A slender, twining shrub with striate, terete glabrescent branches. Leaves ovate or oblong-lanceolate, 1″-2·5″ by ·5″-1·5″, acute or shortly acuminate sometimes mucronate at the apex, rounded or cordate at the base, thick, somewhat fleshy, green, glabrescent, shining above, paler and more or less pubescent particularly on the nerves beneath; petioles ·25″-·5″ long. Flowers small, ·12″ across, in peduncled or sessile, interpetiolar usually umbelliform cymes, sometimes with a short zig-zag axis; peduncles 0-·25″ long, pubescent; pedicels filiform, ·5″-·75″ long and with small linear or ovate hairy bracts at the base. Calyx divided to the base; sepals ovate, acute, pubescent or subhispid. Corolla purple inside; lobes short, obtuse, glabrous; corona staminal of 5 dark-coloured gibbous, suborbicular lobes. Follicles poinard-shaped, 3″-4″ long, tapering, glabrous, striate; seeds ovate, about ·3″ long; coma ·75″ long.

3. T. asthmatica, W. & A. in Wight's Contrib. 51; Fl. Br. I. 4, 44; Dalz. & Gibs. Bomb. Fl. 150; Cooke Fl. Pres. Bomb. 2, 164. *Antamul, pitmari,* Vern.

A twiner with long pubescent or hairy stems and numerous long fleshy roots. Leaves obovate, 1·5″-3″ by ·5″-2,″ acute or very shortly acuminate at the apex, rounded or cordate at the base, thin, glabrous above, more or less pubescent beneath; lateral-nerves 2-3 pairs, distinct beneath; petioles ·25″-·5″ long, pubescent. Flowers ·25″ across in lateral, shortly peduncled, few-flowered, umbellate cymes; umbels 2-3 near the ends of the peduncles; pedicels 1″-1·5″ long, slender, hairy; bracts minute, filiform, hairy. Calyx divided to the base; sepals ·1″ long, ovate-acute, hairy. Corolla deeply lobed, greenish-yellow outside, purplish within; lobes oblong-acute, ·2″ long; coronal-lobes gibbous below, free, cuspidate at the apex. Pollen-masses minute, transverse with distinct caudicles. Follicles fusiform, divaricate, 2″ long by ·25″ thick, tapering to a blunt point, glabrous, striate; seeds ·3″ long, ovate; coma ·75″ long.

16. DREGEA, E. Meyer.

Twining shrubs. Leaves opposite. Flowers middle-sized, green in axillary, umbelliform cymes. Calyx divided to the base. Corolla rotate; lobes overlapp-

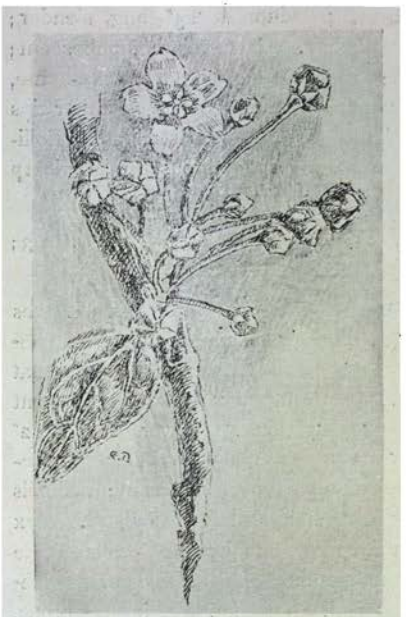

Fig 417. Dregea volubilis, Benth.

ing to the right; coronal-scales 5, hemispheric, fleshy, adnate to the column; inner-angle cuspidate, the tooth incumbent on the anthers. Staminal-column very short, fleshy; anthers with inflexed tips; pollen-masses erect, oblong, shortly pedicelled. Stigma conical. Follicles thick, sometimes winged, often yellow mealy. Seeds comose.

D. volubilis, Benth. Gen. Pl. 775; Fl. Br. I. 4, 46; *Hoya viridiflora,* Br.; Dalz. & Gibs. Bomb. Fl. 153; *Marsdenia volubilis,* Cooke Fl. Pres. Bomb. 2, 166; *M. lanceolata,* Cooke Fl. Pres. Bomb. 2, 167. *Dori, ambri, herandori,* M.; *Khardode,* Bhil.

A large twining shrub with a woody stem; branches glabrous, shining, rough lenticellate, often with small black dots; branchlets green, smooth, striate. Leaves broad-ovate, 1·75″-6″ by 1·25″-4·5″,

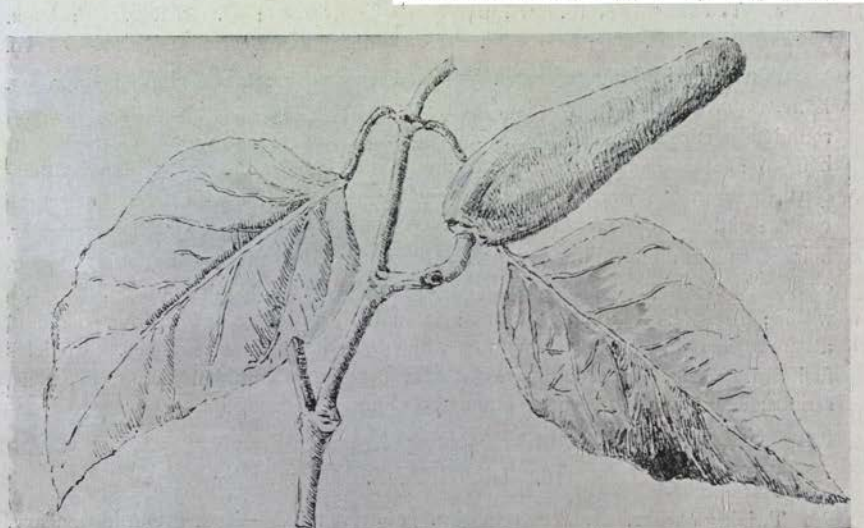

Fig 418. Dregea volubilis, Benth.—*Fruit.*

shortly acuminate at the apex, rounded or cordate at the base, coriaceous, glabrous above, tomentose beneath, 3-5 basal-nerved and with 1-2 pairs of lateral-nerves strong beneath; petioles 1·5″-2·5″ long. Flowers bright-green, middle-sized in many-flowered, drooping, lateral, umbellate cymes; bracts minute, filiform; pedicels ·25″-1″ long, very slender. Calyx divided to the base; sepals ·1″ long, small, ovate, puberulous. Corolla rotate, ·5″ across; lobes triangular, ciliate on the margins; corona star-shaped, consisting of 5 fleshy, whitish lobes, truncate or hooded at the top with cuspidate tips incumbent on the anthers. Staminal-column short, fleshy; pollen-masses erect. Stigma dome-shaped. Follicles 3″-4″ long by 1·25″ thick at the base, linear pear-shaped, with narrow, sutural-grooves, very blunt at the apex, green-dotted, tomentose when young, afterwards glabrous; seeds broadly ovate, margined, yellowish-brown, ·5″ long; coma 1·5″ long.

Fig 419. Dregea volubilis, Benth. Var. angustifolia.

Bengal, Assam and the Deccan peninsula from the Konkan southwards to Ceylon; common in hedges throughout the presidency. Fl. Mch.-May. Fr. C. S.

A tall climber. The variety *"lacuna"* Fl. Br. I. 4, 47; *Hoya lacuna,* DC. Prodr. 8, 639; with hoary or mealy pubescence is more common than the sub-erect velvetty form *angustifolia,* which is common near Poona and generally throughout the Deccan. Yields a very strong fibre.

17. HETEROSTEMMA, W. & A.

Twining shrubs. Leaves opposite, glandular at the base above. Flowers small, in shortly peduncled, lateral, racemose or umbellate cymes. Calyx 5-partite. Corolla rotate; lobes triangular, valvate; corona of 5 large lobes, spreading from the column and lying flat on the corolla. Staminal-column small, depressed; pollen-masses minute, 1 in each anther-cell, broad, sessile, erect. Stigma included, truncate, 5-angled. Follicles slender, straight, terete; pericarp thin. Seeds comose.

H. Dalzellii, Hook. f.; Fl. Br. I. 4, 48; Cooke Fl. Pres. Bomb. 2, 168; *H. Wallichii,* Dalz. & Gibs. Bomb. Fl. 152 (not of Wight).

A twining shrub with long, slender terete glabrous stems and branches. Leaves ovate-oblong, 3″-6″ by 1·25″-3·25″, acuminate at the apex, rounded or cordate at the base, glandular above, membranous, glabrous; basal-nerves 3-5 and nervation prominent; petioles about 1″ long. Flowers small, in lateral, subsessile or very shortly peduncled cymes. Calyx small, divided nearly to the base; sepals ovate, obtuse. Corolla rotate, fuscous within, divided to below the middle; lobes ·12″ long, ovate, acute; corona of 5 conspicuous spathulate processes without appendages on the upper side. Staminal-column short; pollen-masses attached to the carriers by very short caudicles. Stigma depressed. Follicles divaricate, 3″-4″ long by ·25″ thick, slender striate, glabrous; seeds ·25″ long, oblong, narrowly margined; coma 1″ long.

The Konkan at Vengurla and Malvan. Fl. Sept. A very rare species.

18. HOYA, R. Br.

Twining pendulous or epiphytic shrubs. Leaves opposite, thickly fleshy or very coriaceous. Flowers in axillary or terminal umbels. Calyx small, 5-partite. Corolla rotate, waxy; lobes 5, valvate in bud; coronal-scales 5, stellately spreading or ascending, turgid, laterally or vertically compressed often concave on the upper surface, margins usually recurved so as to enclose a hollow space, the inner angle often produced into a tooth or spur which is erect or incumbent on the anther. Staminal-column short; anthers with inflexed membranous tips connivent over the stigma; pollen-masses pedicelled, erect. Follicles usually slender, acuminate. Seeds with a long coma.

Leaves linear, very narrow, fleshy; tip obcordate ... 1. H. retusa.
Leaves broad, elliptic.
Leaves long-petioled; pairs distant ... ... 2. H. Wightii.
Leaves short-petioled often fascicled; margins flat. Calyx and corolla-lobes glabrous ... 3. H. ovalifolia.
Leaves short-petioled not fascicled; margins recurved. Calyx and corolla-lobes hairy ... 4. H. pendula.

1. H. retusa, Dalz. in Hook. Kew Jour. Bot. IV. 294; Fl. Br. I. 4, 56; Dalz & Gibs. Bomb. Fl. 153; Cooke Fl. Pres. Bomb. 2, 169. *Jummaki, bendurki,* K.

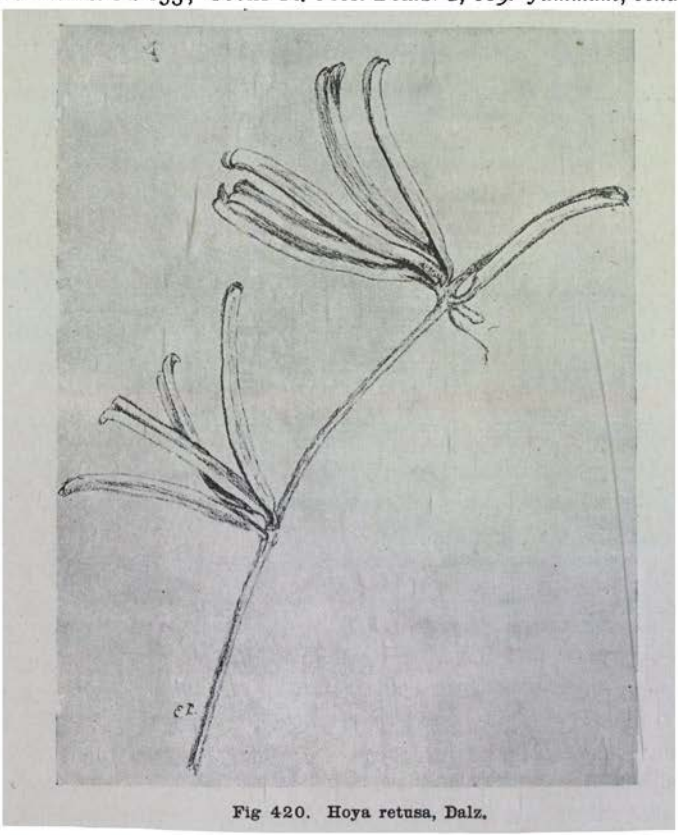

Fig 420. Hoya retusa, Dalz.

A glabrous epiphytic shrub; branches slender, terete, pendulous. Leaves linear, often clustered at nodes along the branches, 2"-2·5" by ·15"-·2", slightly thicker and broader upwards, obcordate at the apex, narrowed at the base, chan-

nelled above, fleshy; midrib prominent beneath; nervation obscure; petioles 0-·1″ long. Flowers axillary in simple, 1-3-flowered fascicles; buds 5-angled, depressed, angles with decurved tips; pedicels slender, ·25″-·75″ long. Calyx divided to the base; sepals minute, ovate, subacute. Corolla white, ·3-·5″ across; tube very short; lobes deltoid-acute, puberulous inside and ciliate on the margins; corona stellate, purple; lobes ovate, horizontal, the broad end outwards, the inner-angle acute. Pollen-masses erect, oblong. Follicles slender.

A woody epiphyte on trees in the rain-forests of the Konkan and North Kanara ghâts; common near Yellapur, apparently endemic. Flowers very rarely and during the R. S. in July.

2. H. Wightii, Hook. f.; Fl. Br. I. 4. 59; *H. pallida,* Dalz. & Gibs. Bomb. Fl. 152; Cooke Fl. Pres. Bomb. 2, 169.

A glabrous, twining shrub; branches smooth, terete with long internodes between the leaves. Leaves ovate or elliptic-lanceolate, 1·25″-3″ by ·75″-1·5, acute or shortly acuminate at the apex, rounded at the base, thick, fleshy; margins recurved; lateral-nerves in dried leaves 3-4 pairs, more or less at right-angles to the midrib; nervation distinct, scanty, irregular. Flowers white in axillary, interpetiolar, peduncled umbels; peduncles ·25″ long; pedicels stout, 1″ long. Calyx divided to near the base; sepals ovate, ·1″ long, obtuse, reflexed. Corolla creamy-white, ·5″-·75″ across, glabrous; lobes broadly triangular-acute; corona of 5, inflated, obtuse, ascending lobes, the broad end outside, the inner angle shortly erect and obtusely spurred. Follicles straight, slender, about 4″ long by ·25″ thick, tapering at both ends; coma nearly 2″ long.

Deccan peninsula from the Bombay ghâts to the Nilgiris. On trees throughout the Konkan and North Kanara; very common on the Supa ghâts mostly in rain-forest. Fl. rarely in R. S. also in Jan. Fr. C. & H. seasons.

3. H. ovalifolia, W. & A. Contrib. 37; Fl. Br. I. 4, 60; Cooke Fl. Pres. Bomb. 2, 170.

A twining sometimes epiphytic shrub; branches thickened at the nodes, glabrous, terete sometimes covered with scattered, raised protuberances. Leaves ovate, 1·5″-3″ by ·75″-1·2″, clustered at the nodes along the branches, obtuse at the apex, acute at the base, thick, fleshy, margins flat; lateral-nerves few, arching, somewhat obscure; petioles ·1″-·2″ long. Flowers white about ·25″ across in lateral, interpetiolar, peduncled umbels, peduncles ·5″-1·5″ long, becoming thick, swollen and scaly; pedicels stout, ·25″-·5″ long. Calyx divided nearly to the base; sepals ·08″ long, ovate, subacute. Corolla deeply divided; lobes triangular-acute, apiculate, reflexed; corona of 5, large, white, horny, spreading lobes, the narrow-end outside, upper-surface concave, inner-angle cuspidate. Staminal-column large; pollen-masses erect. Follicles 5″-6″ long, very slender, curved.

Southern and Western peninsular India, Ceylon, Nilgiris and Mangalore; common in rain-forest on the N. Kanara ghâts near Yellapore. Differs from *H. Wightii* by the shortly petioled, fascicled and smaller ovate leaves with flat magins, smaller flowers and a large distinct corona.

4. H. pendula, Wgt. Ic. t. 474; Fl. Br. I. 4, 61; Dalz. & Gibs. Bomb. Fl. 152.

A twining shrub; branchlets sparsely hairy. Leaves ovate, 1·5″-3″ by 1″-·5″, acute or acuminate at the apex, rounded at the base, thick; margins recurved; nerves distinct; petioles ·25″ long. Flowers white in lateral, peduncled umbels; peduncles interpetiolar, ·5″ long, stout, pubescent; pedicels slender, 1″-1·5″ long, sparsely hairy. Calyx pubescent, divided nearly to the base; sepals ·12″ long, lanceolate-acute. Corolla ·6″ across, white; lobes broadly triangular-acute, densely villous on the inside; coronal-lobes ovate, outer-end subacute, inner-margin spurred. Follicles unknown.

Deccan peninsula, Western ghâts and Nilgiris, Konkan (hills of the Kolaba District). Rare in this presidency, confined apparently to the Konkan. Fl. R. & C. S.

19. OIANTHUS, Benth.

Twining under-shrubs. Leaves opposite, glandular at the base. Flowers medium-sized in few-flowered, lateral cymes. Calyx 5-partite. Corolla ovoid-urceolate, tubular or disciform usually contracted at the mouth; lobes 5, short, valvate; corona cupular consisting of 5, spreading, fleshy, entire or toothed lobes adnate to the staminal-column. Staminal-column minute, depressed; anther-tips short, inflexed; pollen-masses 1 in each cell; ovoid, waxy, ascending. Stigma broadly conical. Follicles unknown.

Corolla urceolate; coronal-lobes 3-toothed at the apex	1.	O. urceolatus.
Corolla tubular or ovoid-urceolate; coronal-lobes entire, rounded	2.	O. deccanensis.
Corolla disciform; coronal-lobes entire at the apex	3.	O. disciflorus.

1. O. urceolatus, Benth. in Hook. Ic. Pl. t. 1191; Fl. Br. I. 4, 49; *Heterostemma urceolatum*, Dalz. in Kew Jour. Bot. 4, 295; Dalz. & Gibs. Bomb. Fl. 152.

A twining undershrub with purple, terete, puberulous stems. Leaves broadly ovate, 2″-4″ by 1″-2″, acute or acuminate at the apex, cordate or rounded at the base where it is furnished on the upper side with a gland; lateral-nerves 2-5; petioles ·25″ long. Flowers in shortly peduncled, few-flowered, lateral umbels. Calyx minute; lobes 5, obtuse. Corolla ·5″-·85″ long very shortly 5-divided at the apex with minute teeth between the lobes; tube urceolate, reddish-purple out-

side; corona of 5, fleshy lobes each 3-toothed at the apex; terminal tooth bent inwards. Anthers short, ending in a coloured membranous appendage. Follicles unknown.

"Hills near Belgaum also at Rewadunda in the Konkan. Fl. July." Dalzell. A very rare species in the Bombay presidency.

2. O. deccanensis, sp. nov. A twining shrub; branchlets terete, yellowish-pubescent. Leaves ovate or lanceolate, 2″-4″ by ·5″-2″, acute or acuminate at the apex, rounded or cordate at the base, thinly coriaceous, scabrous above when young, glabrescent when old, pale and very sparsely pubescent particularly on the nerves beneath; petioles about ·25″ long, sparsely pubescent. Cymes few-flowered usually sessile, interpetiolar; pedicels ·1″-·2″ long, pubescent. Calyx divided to near the base; sepals ·1″ long, oblong, obtuse with membranous margins, sparsely pubescent in the middle. Corolla thick, ovoid-urceolate or tubular, ·5″-·6″ long by ·15″ in diameter; lobes ·05″ long, triangular, valvate, with intermediate, minute teeth; corona 5-lobed; lobes broad, incurved with rounded margins.

Deccan ghâts 18 miles west of Poona. Fl. Aug. A very rare species quite distinct from *O. urceolatus,* Benth.

3. O. disciflorus, Hook. f. with a disciform, depressed corolla and entire corona-lobes is apparently a very rare plant, very doubtfully indigenous within the limits of this presidency.

20. LEPTADENIA, Br.

Erect rigid almost leafless or twining glabrous leafy shrubs. Leaves opposite or O. Flowers small in axillary, crowded, umbelliform, many-flowered cymes. Calyx turbinate, shortly 5-lobed. Corolla rotate; lobes bearded, valvate in bud; corona double, the corolline of 5 transverse or rounded, fleshy lobes hairy at the tips, between the corolla-lobes; the staminal of a raised, undulate, fleshy ring at the base of the staminal-column. Staminal-column short; anthers inflexed; tips without appendages; pollen-masses globose, sessile, erect. Stigma included, flat, 5-angled, 2-cuspidate. Follicles acuminate, smooth. Seeds comose, flat, winged.

Twining. Leaves broad, coriaceous	... ...	1. L. reticulata.
Erect. Leaves linear, leathery or O	... ...	2. L. Spartium.

1. L. reticulata, Wight & Arn. Contrib. 47; Fl. Br. I. 4, 63; Dalz. & Gibs. Bomb. Fl. 152; Cooke Fl. Pres. Bomb. 2, 172. *Khar-khodi,* M.; *Pala-kuda, shinguti, hodhi,* Vern.

A twining shrub with slender glabrous or pubescent branches; branchlets

hoary. Leaves ovate or elliptic, 1″-2″ by ·25″-1″, acute or shortly acuminate at the apex, rounded or subacute at the base, thinly coriaceous, glabrous above, pubescent beneath; lateral-nerves 5-6 pairs more or less distinct beneath; petioles ·2″-·75″ long, hoary. Flowers small, greenish-yellow in interpetiolar, many-flowered, shortly peduncled, rounded cymes; peduncles 1-2 together, ·2″-1″ long; pedicels ·08″-·12″ long, grey-puberulous. Calyx divided to about the middle, tomentose outside; lobes obtuse. Corolla about ·25″ across; tube very short, glabrous; lobes ·1″ long, ovate acute, erect, grey-pubscent on both sides; margins revolute, sometimes keeled and thickened at the apex inside, corolline-corona of 5, truncate, fleshy lobes, staminal-corona minute, undulating, close to the anthers. Staminal-column minute; pollen-masses ovoid, attached by moderately long caudicles to the minute carriers. Follicles 2″-3″ long by ·5″-·75″ thick, sub-woody, smooth, tapering to the short obtuse beak; seeds ovate, ·25″ long, acute; coma about 1·5″ long.

Eastern Punjab and from Banda southwards, throughout the Deccan peninsula, Guzerat, Surat, Ceylon. "Common near the coast of the Konkan" Dalz. Throughout the dry Deccan, abundant near Dambal in the Dharwar district. Fl. July-Aug. Fr. Sept.-Oct. Bark corky.

2. L. Spartium, Wight Contrib. 48; Fl. Br. I. 4, 64; Cooke Fl. Pres. Bomb. 2, 173; *L. Jacquemontiana,* Dcne.; Dalz. & Gibs. Bomb. Fl. 152. *Kip,* Vern.

An erect shrub, 3′-4′ high with slender, terete branches, puberulous when young. Leaves usually absent, when present sometimes on young shoots, linear-lanceolate, 1″-2″ by ·12″, leathery, glabrous, subsessile. Flowers yellow in peduncled, hoary cymes, distantly arranged on the branches somewhat smaller but similar to those of *L. reticulata.* Follicles 3·5″-5″ long by ·3″ thick, glabrous with a long slender straight beak; seeds obovate, ·3″ long, glabrous, coma 1·5″ long.

Punjab and Sind, extending eastwards to the Jumna, Guzerat, Kathiawar, (sea-shore south of Gogha), very common in Sind. Fl. Oct. Water does not rot the fibre which is in consequence much used in Sind for ropes to draw water from wells. Branches serve as cattle-fodder.

Order LXII.—LOGANIACEÆ.

Trees or shrubs often climbing or herbs. Leaves opposite, entire, generally connected by interpetiolar stipules or a raised, transverse line. Inflorescence cymose. Flowers regular, hermaphrodite. Calyx inferior, 4-5-toothed. Corolla gamopetalous, 4-5-lobed; lobes imbricate or valvate. Stamens 4-5, inserted on the corolla-tube and alternate with its lobes. Ovary free usually 2-celled; ovules 1 or more in each cell; style simple; stigma often 2-lobed. Fruit a capsule or berry, 1-many-seeded; albumen copious; cotyledons broad or narrow; radicle usually inferior.

Very nearly allied to the *Rubiaceæ* from which it differs by the free ovary. The genera usually included in the *Loganiaceæ* are not closely related to each other.

Fruit a 2-valved capsule. Corolla imbricate ...	1. Buddleia.
Fruit indehiscent.	
Corolla contorted; lobes twisted to the left ...	2. Fagræa.
Corolla-lobes valvate	3. Strychnos.

1. BUDDLEIA, Linn.

Small trees or shrubs, often mealy or woolly-tomentose. Leaves opposite, entire, crenate or toothed; petioles united by a raised stipulary line. Flowers tetramerous, axillary or in terminal 3-5-flowered cymes arranged in panicled spikes and racemes. Calyx campanulate, 4-merous, persistent. Corolla-lobes imbricate in bud. Stamens 4; anthers nearly sessile. Ovary 2-celled; ovules many in each cell, many-seriate; style linear; stigma clavate or capitate. Capsule septicidally 2-valved, leaving a free dissepiment in the centre. Seeds many; testa usually loose or expanded into a wing or tail; albumen fleshy; embryo straight.

B. asiatica, Lour. Fl. Cochinch. 72; Dalz. & Gibs. Bomb. Fl. 180; Fl. Br. I. 4, 82; Brandis For. Fl. 318; Bedd. Fl. Sylv. 163; Gamble Ind. Timb. 495; Cooke Fl. Pres. Bomb. 2, 183.

A large evergreen shrub; branchlets densely grey-tomentose. Leaves lanceolate, 3″-5″ by ·25″-1″, acute or acuminate at the apex, narrowed into a short petiole at the base, thin, glabrous, dark-green above, densely yellowish or grey-tomentose beneath; lateral-nerves 10-12 pairs arching upwards and united within

the margin, strong beneath; petioles ·2″ long. Flowers white, scented, ·2″ long, shortly pedicelled in dense axillary or terminal, simple or paniculate usually continuous spikes 3″-5″ long; bracts large, lanceolate, deciduous, tomentose. Calyx ·08″ long, deeply 4-divided; lobes acute, white-tomentose outside. Corolla tubular, nearly twice as long as the calyx, pubescent outside and in the throat; lobes obtuse as long as the tube. Ovary ovoid, glabrous; style clavate. Capsule nearly ·2″ long, bicarpellary, nodding, glabrous; pedicels short, recurved and the persistent calyx tomentose; seeds minute, reticulately winged at the extremities.

Throughout tropical India, ascending to 5000′ in the outer Himalaya, Burmah on deserted Toungyas, Malaya, Cochinchina, China, absent from Ceylon. Bombay presidency in monsoon-forest also locally common along the banks of nallahs and ravines in the Konkan and Deccan areas, Guzerat in the Dangs. An ornamental garden plant often cultivated for its fragrant flowers.

Bark thin grey. Wood grey, moderately hard. Annual rings marked by a belt of closely-packed pores in the spring-wood. Pores small, scanty. Medullary rays fine, numerous. Weighs 44 lbs. to the cub. ft. Gamble.

3. FAGRÆA, THUNB.

Trees or scandent shrubs, often epiphytic. Leaves usully entire; petioles dilated at the base or united by a stipulary sheath. Flowers white, large or small in axillary or terminal, bracteate cymes. Calyx deeply 5-divided; lobes thick, broadly imbricate, persistent. Corolla with a long tube; lobes 5, twisted to the left. Stamens 5; filaments filiform. Ovary 2-celled; ovules many in each cell; style filiform; stigma capitate. Fruit a 1-2-seeded berry. Seeds numerous, immersed in pulp; albumen horny; embryo small.

F. obovata, Wall. Cat. 1595; Fl. Br. I. 4, 83; Bedd. Fl. Sylv. 164; Gamble Ind. Timb. 495; Cooke Fl. Pres. Bomb. 2, 183; *F. coromandeliana*; Bedd. Fl. Sylv. t. 244. *Menakalli, hannachalle, ginnuna*, K.

A large epiphytic or scandent shrub sometimes a small tree; epiphytic stems furnished with numerous, horizontal anchoring roots; branches with prominent and conspicuous leaf-scars. Leaves elliptic or obovate-oblong, 3″-6″ by 1·5″-3″, shortly, acuminate at the apex, narrowed into the petiole at the base, glabrous, entire, rather fleshy, dark-green above, paler beneath; lateral nerves few, prominent beneath; petioles ·25″-·5″ long; stipules thick, adnate to the petiole. Flowers large, white, or yellowish, scented, in peduncled 1-5-flowered, terminal cymes; peduncles stout, ·5″-1″ long, pedicels very short. Calyx fleshy about ·7″ long; lobes broadly ovate, obtuse, about as long as the tube, persistent and accrescent in fruit. Corolla-tube 1·5″ long, campanulate above; lobes obtuse nearly as long

as the tube. Stamens inserted about the middle of the corolla-tube. Fruit ellipsoid or oblong-acute, 1″-1·5″ long, shining green, glabrous, black when ripe; seeds subglobose, ·1″ in diameter, rugose.

Eastern Himalaya, abundant in the Bhutan hills, Khasia Mts. up to 4000′, Deccan peninsula, up to 6000′, frequent in the Nilgiris, common in the lower montane zone of Ceylon above 2000′. In the monsoon and rain-forest of the Konkan and N. Kanara. Fl. R. S. Fr. C. S.

Usually a small tree in the northern parts of its habitat, sometimes semi-scandent in Ceylon. In N. Kanara where it is found in the Kumpta and Sircy forests is always a climbing epiphyte throwing out branched anchoring roots at intervals on the host stem like a *Ficus*. Stems about 3″ in diameter. Bark smooth, grey, lenticellate; inner-bark white. Wood reddish, moderately hard, close-grained and smooth. Pores small, scanty, sometimes in short radial lines. Medullary rays fine and very fine, numerous. Weighs about 46 lbs. to the cub. ft.

3. STRYCHNOS, Linn.

Trees or scandent shrubs with short, watch-spring, axillary tendrils. Leaves opposite, entire, usually 3-5-nerved; stipules O. Flowers white, pentamerous, small, in terminal or axillary cymes. Calyx small, 4-5-toothed. Corolla funnel-shaped or tubular; lobes 4-5, valvate. Stamens 4-5, inserted in the throat of the corolla. Ovary 2-celled throughout or 1-celled in the upper portion; ovules several in each cell on fleshy placentas; style filiform; stigma capitate. Fruit a globose berry with 1-several large seeds immersed in pulp. Seeds more or less compressed; embryo small, eccentric, in cartilaginous albumen; cotyledons foliaceous.

Scandent shrubs with circinate tendrils.		
Berry 1-2-seeded, ·5″-·6″ in diameter	1.	S. colubrina.
Berry many-seeded, 1″-1·5″ in diameter	2.	S. Dalzellii.
Trees.		
Fruit black, 1-seeded, ·75″ in diameter	3.	S. potatorum.
Fruit orange, many-seeded, 2″-4″ in diameter	4.	S. Nux-vomica.

1. S. colubrina, Linn, Sp. Pl. 271; Fl. Br. I. 4, 87; Dalz. & Gibs. Bomb. Fl. 155; Bedd. Fl. Sylv. 163; Cooke Fl. Pres. Bomb. 2, 184; Gamble Ind. Timb. 497. *Kanal, kajra-vel,* Vern.

A lofty woody climber with simple or geminate watch-spring, woody tendrils; branches warted, lenticellate. Leaves ovate or elliptic-lanceolate, 3″-5″ by 1·75″-2·5″, acute or acuminate at the apex, narrowed into the petiole at the base,

coriaceous, glabrous, shining above, paler beneath; basal-nerves 3, strong beneath; petioles ·25″-·5″ long. Flowers in short-peduncled, axillary, small, puberulous cymes. Calyx ·08″ long; segments orbicular, imbricate, puberulous, red-ciliolate. Corolla ·15″ long; lobes longer than the tube and with a ring of long white hairs at the mouth above the stamens. Filaments short; anthers cordate, white-ciliate below, puberulous above. Ovary glabrous, not or gradually tapering into the style. Berry ovoid, ·6″ long, usually 1-2-seeded; epicarp crustaceous; seeds ovoid, slightly compressed, brown, glabrous.

Western peninsula in rain-forest from the Konkan to Cochin, Ceylon, on the N. Kanara and Konkan ghâts; common in the jungles near the Tinai ghàt and about Santgal in the Kumpta taluka of N. Kanara. Fl. Oct.-Jan. Fr. Jan.-Mch.

A large climber with stems up to 3″ in diameter. Bark brown, smooth, thick; inner-bark reddish-brown. Wood used in native medicine.

2. S. Dalzellii, C. B. Clarke in Fl. Br. I. 4, 87; Cooke. Fl. Pres. Bomb. 2, 185; *S. axillaris,* Dalz. & Gibs. Bomb. Fl. 155, not of Coleb.

A large climber with ferruginous pubescent, circinate tendrils thickened upwards. Leaves ovate or eliptic-lanceolate, 3″-5″ by 1·5″-2·25″, acute at the apex, narrowed into the petiole at the base, coriaceous, glabrous, 3-basal-nerved; nerves strong beneath; petioles ·25″ long. Cymes axillary, short, densely-flowered, sub-capitate; bracts and bracteoles short, twin, ovate, acute, ciliate. Calyx ·1″ long, puberulous; lobes orbicular, ciliolate. Corolla-lobes much longer than the tube, villous on the inside; anthers hairy at the base. Ovary glabrous; style as long as the ovary. Berry globose, 1″-1·5″ in diameter, many-seeded; seeds discoid, ·3″ in diameter. This species differs from *S. colubrina,* principally in the large globose, many-seeded fruit.

Western peninsula, Konkan, Malabar and the Bababudan hills of Mysore. A very rare plant in the Bombay presidency. The species is apparently named by C. B. Clarke in Fl. Br. I. 4, 87 from specimens collected by Dalzell on the Southern ghâts and referred to in the Bomb. Fl. as *S. axillaris,* Coleb. Ritchie also collected specimens referred to the same species on the Supa ghâts of N. Kanara.

3. S. Nux-vomica, Linn.; Roxb. Fl. Ind. Ed. Carey & Wall. 2, 262; Fl. Br. I. 4, 90; Dalz. & Gibs. Bomb. Fl. 155; Bedd. Fl. Sylv. t. 243; Brandis For. Fl. 317; Cooke Fl. Pres. Bomb. 2, 185; Gamble Ind. Timb. 497. *Snake-wood* or *Strychnine tree*; *Kar,* M. *Kasarkana-mara,* K. *Kajra,* Hind.

A medium-sized or large deciduous or evergreen tree; branchlets opposite, glabrous, channelled, compressed and dilated at the nodes, often converted into strong, sharp, woody spines. Leaves broadly elliptic, 2″-5″ by 1·5″-4″, shortly obtusely acuminate at the apex, narrowed into the petiole or rounded at the often

unequal-sided base, thin, glabrous, shining; basal-nerves 5, the outer pair somewhat faint; venation reticulate, conspicuous; petioles ·25″-·5″ long. Flowers greenish-white, ·5″ long, in short, terminal, puberulous cymes. Calyx ·1″ long, puberulous, shortly 5-toothed. Corolla-tube cylindric, ·3″ long, hairy within; lobes 5, ⅓ the length of the tube, spreading. Ovary glabrous; style slender, exserted; stigma capitate. Fruit globose, 1″-2″ in diameter, yellow; seeds discoid or concavo-convex shaped, ·75″ in diameter immersed in white pulp, covered with silky hairs, radiating from the centre of the seed; cotyledons cordate; radicle long.

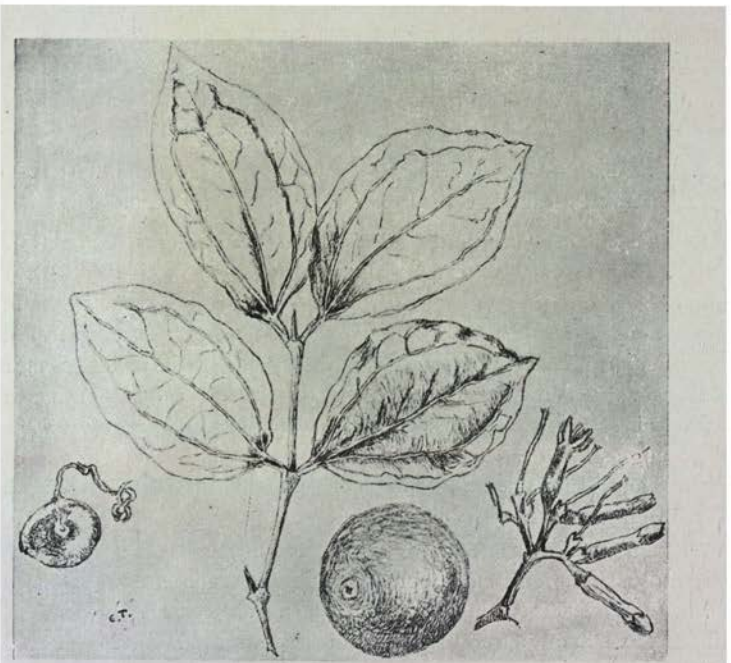

Fig 421. Strychnos Nux-vomica, Linn.

Bengal, Burmah, Southern India, Deccan, Carnatic and dry parts of Ceylon; throughout the presidency in moist monsoon-forest, very common in the Konkan and N. Kanara; abundant on laterite along the sea-coast in evergreen thorn-scrub; one of the few trees growing in this dry formation where it exists protected by its poisonous qualities. Fl. Mch. April. Fr. ripe at various times throughout the year. A medium-sized tree, sometimes attaining a height of 100′ with a diameter of over 3′; in N. Kanara and the Konkan usually spinous. Bark thin, grey, smooth or rough, covered with minute, open lenticels sometimes exfoliating in thin curly scales. Green parenchyma strongly developed. Wood

brownish-grey, hard and durable with a strong bitter taste. Pores of 2 kinds; large branched ducts and small pores arranged in irregular ramified or branched patches joined by concentric, irregular bands of white tissue. Medullary rays distinct, moderately broad and fine. Weighs 60 lbs. to the cub. ft. Yields the well known alkaloids *Strychnine* and *Brucine* obtained from the seeds of which large quantities are exported to Europe from Madras, Travancore, and other W. peninsular ports. In N. Kanara the low price of the produce in the London market, (7 to 10 shillings a cwt.) does not allow of the collection with a reasonable margin of profit. The seeds also yield a dye and an oil used in native medicine. The bark is used as a tonic and as an external application for skin diseases in Ceylon. The pulp surrounding the seeds is eaten by monkeys and hornbills, other parts of the tree are avoided by animals; white-ants will not touch the wood which is however very little used in this presidency. In the dry parts of its habitat like the laterite region of N. Kanara the *Nux-vomica* tree is bare of leaves for a short period during the hot season but in the moister regions it is an evergreen. The branches are not used by the Haiga cultivators in N. Kanara for conversion into wet-manure as their sharp spines wound the feet of the cattle in the sheds; they are however like most other species lopped for dry-leaf manure used in the supari gardens. The flowers have a strong odour of turmeric.

4. S. potatorum, Linn, f. Suppl. 148; Fl. Br. I. 4, 90; Dalz. & Gibs. Bomb. Fl. 156; Bedd. Fl. Sylv. 163; Brandis For. Fl. 317; Cooke Fl. Pres. Bomb. 2, 186; Gamble Ind. Timb. 498. *Clearing-Nut Tree*; *Nirmali, nermali, gajrah,* Vern.; *Nivali,* M,; *Chili-gidda, (Chelbiga seeds),* K.

A small or moderate-sized, glabrous deciduous tree; branchlets opposite, bough lenticellate, swollen at the nodes. Leaves elliptic-lanceolate, 2″-3″ by ·75″-1·5″, acute or acuminate at the apex, narrowed into the petiole at the base; coriaceous, glabrous, shining, 3-5 basal-nerved, lateral-nerves near the base; petioles ·1″ long. Flowers white, fragrant, about ·25″ long in shortly peduncled, many-flowered, glabrous, axillary cymes. Calyx deeply 5-lobed, ·08″ long; lobes triangular acute. Corolla-tube campanulate about ·1″ long; lobes as long as the tube with tufts of hair at the base of each between the stamens. Ovary ovoid; style cylindric; stigma obscurely 2-lobed. Berry subglobose, ·5″-·75″ in diameter, black when ripe; seeds 1-2, ·5″ in diameter, pale-yellow, covered with short adpressed, silvery hairs, thick, blunt, lenticular, immersed in pulp.

Throughout the peninsula in deciduous dry forests, Bengal, Burmah, Central provinces, Southern India, Orissa and the Carnatic, dry parts of Ceylon; Southern Mahratta country (Belgaum district) growing on Cudappah sandstone, Konkan, Deccan and N. Kanara.

Usually a small tree with an irregularly fluted stem and a black, scaly, corky, cracked, thick bark. Wood white, turning yellow on exposure, hard and close-

grained; no heart-wood. Pores of 2 kinds: a few large pores or ducts filled with a white, shining substance and numerous small pores arranged in irregularly ramified, branched patches. Medullary rays moderately broad and fine, very distinct, crossed by concentric broad lines of light-coloured tissue. Weighs about 60 lbs. to the cub. ft. The wood is of good quality and seasons well, it is used extensively in the Madras presidency for carts, agricultural implements etc. The seeds are not poisonous and are used for clearing muddy water, the albumen acting as a precipitant, hence the specific name "potatorum" The pulp of the fruit is edible and is sometimes made into preserves.

Order LXIII.—BORAGINACEÆ.

Herbs shrubs or trees rarely climbers. Leaves usually alternate, entire, exstipulate. Inflorescence definite; flowers regular, mostly pentamerous, bisexual, sometimes polygamous, usually in scorpioid cymes, rarely solitary and axillary. Calyx inferior, campanulate or cylindric; lobes 4-5 (rarely 6-8). Corolla valvate in bud, usually persistent in fruit. Corolla gamopetalous, tubular, funnel-shaped or rotate, often with scales in the throat; lobes as many as in the calyx. Stamens inserted in the corolla-tube as many as the lobes and alternate with them; filaments sometimes with a basal-scale; anthers lobed at the base. Disk annular, entire or lobed, sometimes inconspicuous. Ovary free, 2-celled; cells 2-ovuled or 4-celled with cells each 1-ovuled; ovules erect or attached to the inner angle of the cell; style terminal in the entire and gynobasic in the lobed ovaries, entire or branched. Fruit drupaceous or dividing into 2-4 nutlets. Seeds erect, oblique; embryo straight; radicle short, superior; albumen O or scanty.

Fruit a 1-stoned drupe; style twice bipartite .... 1. Cordia.

Fruit a drupe with 2-4 pyrenes.

Style bifid or divided to near the base or styles 2 ... 2. Ehretia.

Style 1, filiform; stigma capitate or minutely 2-lobed 3. Rhabdia.

1. CORDIA, Linn.

Small trees or shrubs. Leaves alternate or subopposite, petiolate. Flowers polygamous, male and bisexual, in terminal or leaf-opposed, corymbose cymes, ebracteate. Calyx tubular or campanulate; teeth usually 5, short, accrescent in fruit. Corolla funnel-shaped; lobes 4-8. Stamens inserted on the throat of the corolla and as many as the corolla-lobes; filaments exserted or included often hairy at the base. Ovary 4-celled, glabrous; cells 1-ovuled. Drupe ovoid; endocarp bony usually 4-celled and 4-seeded, perforated at the apex. Seeds exalbuminous; cotyledons plicate; radicle short.

Leaves alternate, 3-5-basal-nerved.

Filaments hairy at the base.

Calyx not ribbed.

Leaves glabrous beneath ... ... 1. C. Myxa.

Leaves white-tomentose beneath ... ... 2. C. Wallichii.

Calyx more or less ribbed ... ... 3. C. Macleodii.

Filaments glabrous.

Leaves large and long-petioled ...	...	...	4.	C. fulvosa.
Leaves small and short-petioled	...	...	5.	C. monoica.
Leaves subopposite, feather-veined ...	...	...	6.	C. Rothii.

1. C. Myxa, Linn. Sp. Plant. 190; Fl. Br. I. 4, 136; Dalz. & Gibs. Bomb. Fl. 173; Brandis For. Fl. 336; Bedd. Fl. Sylv. 165; Cooke Fl. Pres. Bomb. 2, 199; Gamble Ind. Timb. 500; *C. obliqua*, Willd. Phytogr. 4; C. B. C. in Fl. Br. I. 4, 137; *C. latifolia.* Roxb. Fl. Ind. 2, 330; Dalz. & Gibs. Bomb. Fl. 173; Grah. Cat. 136; Rheede Hort. Mal. 4, t. 37. *Chella,* K. *Shelu, sherti, chokri,* M. *Bhokar, gondani, vargund,* Vern. *Lessuri, giduri,* Sind.

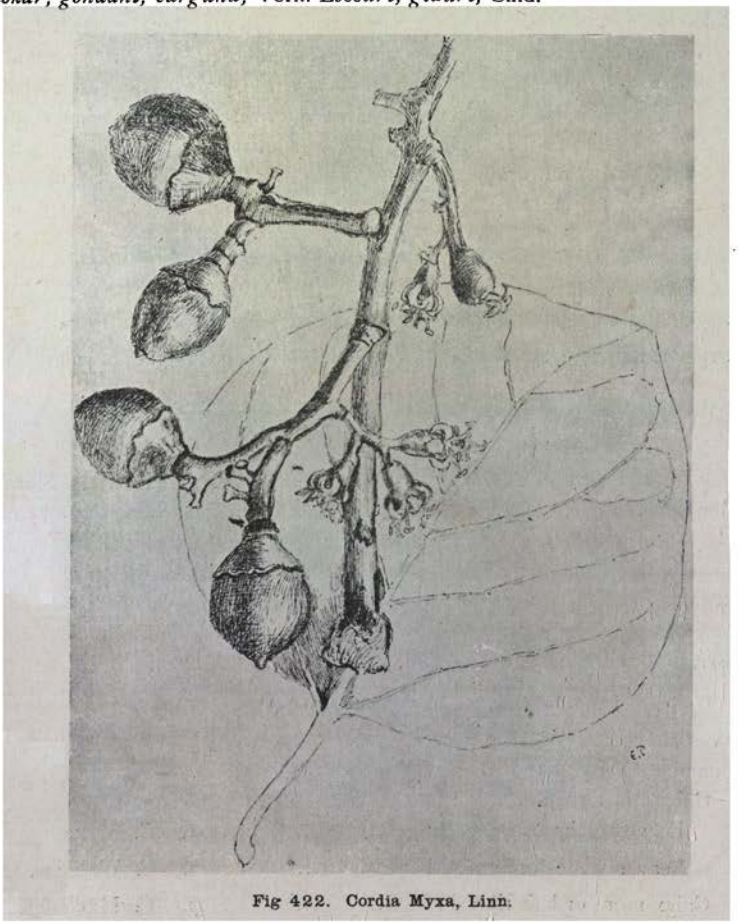

Fig 422. Cordia Myxa, Linn.

A medium-sized tree; branchlets glabrous, shining, sparsely lenticellate, or tomentose. Leaves variable in shape, broadly obovate or nearly orbicular, 3″-5″ by 2·5″-4·5″, acute or rounded at the apex and acute, rounded or broadly cordate at the base, entire or repand-dentate in the upper half, coriaceous, glabrous and rough above, glabrous or more or less brownish-tomentose beneath; lateral-nerves 4-5 pairs; lower 1-2 pairs basal and prominent beneath; cystoliths absent from both surfaces; petioles ·5″-2″ long. Flowers white, polygamous, in lax, terminal, pedunculate cymes; buds globose; peduncles 1″-3″ long; bracts O. Calyx campanulate, ·2″ long, glabrous outside, silky-pubescent within, closed over the corolla in bud, ultimately divided into 5, irregular lobes. Corolla twice as long as the calyx, glabrous; tube included in and as long as the calyx; lobes 5, oblong-obtuse as long as the tube. Stamens exserted; filaments hairy at the base. Drupe globose or ovoid, acuminate, ·5″-1·25″ in diameter, smooth, yellow or pinkish, seated on the saucer-like, 5-10 sinuate-lobed, striate calyx; stone hard, 1-2-celled, surrounded by viscid, translucent pulp.

Tropical India, Burmah and Ceylon, ascending to 5000′ in the Western Himalaya, Cochinchina, Tropical Australia and Egypt, sometimes cultivated; throughout the presidency and Sind in dry deciduous forests also in moist monsoon-forest in the Konkan and N. Kanara, Satpuras and Western ghâts generally. Fl. Mch.-April. Fr. June to Sept.

Var. *tomentosa*, with the branchlets and undersides of the leaves densely tawny tomentose is common about Mudgode in the N. Kanara district.

A very hardy tree often with a short crooked trunk up to 2′ in diameter. Bark thick, brownish-coloured, rough and longitudinally fissured; inner-bark fibrous. Wood grey or light-brown; no distinct heart-wood, moderately hard, strong and seasons well, but is liable to the attacks of insects. Pores large and small, scanty and scattered. Medullary rays alternately fine and broad, crossed by broad lines of light-coloured tissue consisting of large, rectangular or 6-angled wood-cells. Weighs about 40 lbs. to the cub. ft. The bark yields a strong fibre made into ropes and the wood which does not stand exposure is employed for boat-building, agricultural-implements, gun-stocks, well-curbs etc. The mucilaginous unripe fruit is cooked as a vegetable and made into pickles; the ripe fruit *(Sebestan)* is used in native medicine and is also a favorite food of birds and other animals. The stone-kernels are eaten, they taste like filberts. The adhesive viscid pulp of the ripe fruit is used for bird-lime.

2. C. Wallichii, G. Don; Brandis For. Fl. 337; Dalz. & Gibs. Bomb. Fl. 174; Bedd. Fl. Sylv. t. 245; Cooke Fl. Pres. Bomb. 2, 200; *C. obliqua,* var. *Wallichii,* C. B. C.; Fl. Br. I. 4, 137. *Burgund, duhiwur,* Vern. *Geduri,* Sind. *Sepisten, pisten,* Guz. *Buralessura,* Hind.

A medium-sized tree; branchlets glabrous, lenticellate. Leaves broadly ovate,

3″-6″ by 2·5″-5″, rounded or acute at the apex, rounded or subcordate, rarely acute at the base, coriaceous, glabrous above, with or without minute cystolithic disks, densely grey stellate-pubescent beneath; nerves 6 pairs, lower 2 pairs basal; petioles 2″-3″ long. Flowers white, polygamous, about ·5″ long, in terminal or lateral, peduncled paniculate cymes; peduncles angular, glabrous, 2″-3″ long. Calyx globose-campanulate, ·25″ in diameter, closed round the corolla in bud; tube densely white-hairy at the top outside, glabrous below, silky within; teeth short, triangular, acute, densely white-hairy on both sides. Corolla white; tube included in the calyx, hairy at the throat; lobes lanceolate, shorter than the tube. Filaments hairy at the base. Ovary ovoid gradually narrowed into the style. Drupe ovoid or globose, acuminate, about 1″ in diameter; stone 2-celled, ·6″ by ·5″ compressed, margined and with central longitudinal ridges, seated on the strongly striate calyx.

Western peninsula from Guzerat to Mysore in deciduous monsoon-forest, sparsely distributed throughout the presidency, locally common in parts of Guzerat and in the Mundgode division of N. Kanara. Fl. Dec.-Jan. Fr. Apl.-May. Distinguished from *C. Myxa*, L. principally by the grey-stellate not tawny-tomentose, densely pubescent undersides of the leaves, larger flowers with white-hairy calyx-lobes and the long acuminate fruit. The economic uses of the tree are the same as those of *C. Myxa*, L.

3. C. Macleodii, Hook, f. & Thomp. in Jour. Linn. Soc. 2, 128; Fl. Br. I. 4, 139; Brandis For. Fl. 337; Cooke Fl. Pres. Bomb. 2, 200; Gamble Ind. Timb. 502. *Dhaivan, daiwas, dhaim, bhote.* M. *Hadang,* K.

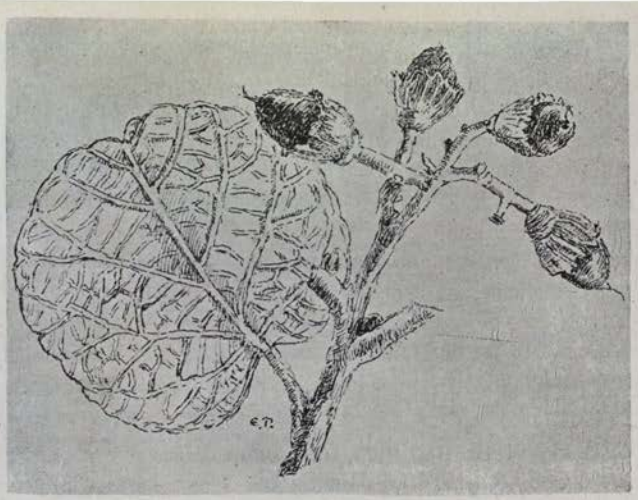

Fig 423. Cordia Macleodii, Hook. f.

A small or medium-sized tree; branches grey-tomentose. Leaves alternate, orbicular-ovate, 4″-8″ by 4″-7″, obtuse at the apex, obtuse, truncate or deeply cordate at the base, irregularly crenate on the margins, coriaceous, pubescent when young on the upper surface; old leaves glabrous rough and more or less closely covered with white cystolithic disks above, closely white-woolly or tawny-tomentose beneath; lateral-nerves about 6 pairs, lowest 1-2 pairs basal, strong beneath; petioles 1″-3″ long, tomentose. Flowers white, polygamous, subsessile, in terminal and lateral, peduncled, short often congested, paniculate or corymbose cymes; pedicels very short or O, articulated beneath the flower. Calyx obovoid in bud, ·25″ long, densely white-tomentose; tube campanulate; lobes short, obtuse. Corolla-tube included in the calyx; lobes half the length of the calyx, white, veined, spathulate, induplicate in bud. Stamens exserted; filaments hairy at the base; anthers of the male flowers large, cordate, those of the hermaphrodite flowers smaller. Ovary conical, rudimentary in the male flower. Drupe green, ovoid acuminate, ½-exserted from the more or less ribbed calyx.

Central India, Rajputana, Orissa, Konkan, Kanara and Belgaum, Khandesh Akrani at 3700′, Bababudan hills Mysore at 3000′ in deciduous, dry forests, commonly planted along road-sides in the Dharwar and in the dry parts of the Belgaum districts. Fl. and young leaves in Apl.-May. Fr. C. S. A deciduous tree, 30′-40′ high with a diameter up to 2′. Bark smooth, white, soft and corky. Wood hard, light or dark-brown, smooth, mottled, tough and elastic. Pores large or small, enclosed in irregular, concentric bands of white tissue. Medullary rays short, broad and fine, prominent. Weighs about 50 lbs. to the cub. ft. An excellent timber suitable for furniture and ornamental cabinet work, makes good fishing-rods. In N. Kanara the wood was formerly extensively used in the construction of country carts by timber contractors and the tree has now become rather scarce in consequence.

4. C. fulvosa, Wight Ic. t. 1380; Fl. Br. I. 4, 140; Bedd. Fl. Sylv. 166; Cooke Fl. Pres. Bomb. 2, 201; *Kurwesh,* K.

A small tree; branchlets fulvous-pubescent. Leaves ovate, 1·5″-3″ by 1″-1·75″, obtuse or subacute at the apex, subacute or rounded at the base, entire or repand-toothed in the upper half, coriaceous, scabrous with numerous small raised white cystoliths above, densely clothed with hard brown tomentum beneath; petioles tomentose, ·5″-·75″ long. Flowers white, polygamous in short, congested, brown-tomentose, terminal, paniculate cymes; pedicels O-·1″ long. Calyx narrow-tubular or obconic, ·3″ long, cleft at the top into 4-6 very shallow, obtuse lobes each with a tuft of white hairs at the apex. Corolla-tube short; lobes 4-6, obovate-oblong, longitudinally 4-veined, bifid at the apex, exserted from the calyx-tube. Filaments glabrous. Ovary ovoid, ·2″ long, gradually narrowed upwards into the slender style. Berry ovoid, ·5″ long, obtuse at the top, seated on the cup-shaped,

irregularly lobed, fulvous-pubescent calyx; stone ovoid, rough, perforated at the apex.

Western Deccan peninsula in dry, deciduous forests, N. Kanara, Belgaum (in the Sutguttee and Gokak jungles) and the Konkan. A rare tree in the Bombay presidency. Fl. and Fr. July-Aug. The leaves would make a good substitute for sand-paper.

5. C. monoica, Roxb. Fl. Ind. Ed. Carey & Wall. 2, 334; Fl. Br. I. 4, 137 Cooke Fl. Pres. Bomb. 2, 201; *C. polygama*, Roxb.; Bedd. Fl. Sylv. 166; Grah. Cat. Bomb. Pl. 136; Trimen Fl. Ceyl. 3, 193.

A small or moderate-sized tree; branchlets and young parts densely tomentose. Leaves ovate, 2″-4″ by 1·75″-2″, obtuse or subacute at the apex, rounded or shortly cuneate at the base, coriaceous, hard, scabrous above with small white, raised cystoliths, more or less tomentose beneath, 3-nerved at the base; petioles about ·25″ long. Flowers white, subsessile, in dense shortly peduncled, corymbose cymes. Calyx funnel-shaped, ·25″ long, tomentose; lobes very short, triangular. Corolla-lobes exserted from the calyx-tube, oblong-obtuse or acute. Stamens exserted; filaments glabrous. Drupe ovoid, about ·5″ long, apiculate, smooth, bright-yellow, seated on the enlarged, loose, irregularly lobed, pubescent calyx; stone drilled at the top, 4-celled, 1-4-seeded.

Deccan peninsula from Orissa and the Central provinces to Ceylon. In dry open thorn-forest near Badami (Bijapore collectorate) on sandstone. Fl. & Fr. Aug. Sept. A rare species in the Bombay presidency.

6. C. Rothii, Roem. & Schul. Syst. 4, 798 (1819); Fl. Br. I. 4. 138; Dalz. & Gibs. 174; Brandis For. Fl. 338; Gamble Ind. Timb. 509; Bedd. Fl. Sylv. 166; Trimen Fl. Ceyl. 3, 194; Cooke Fl. Pres. Bomb. 2, 202; Wight Ic. t. 1379; *C. angustifolia,* Roxb. Fl. Ind. 2, 338 (not of Roem. & Schul.); Grah. Cat. Bomb. Pl. 136. *Gundi, gundni, gondani,* Vern. *Liari, liai, lijar,* Sind.

A small tree with drooping branches; branchlets slender, glabrous. Leaves subopposite, lanceolate-oblong, 1·5″-3″ by 1·25″-·5″, rounded or bluntly acute at the apex, narrowed into the petiole at the base, coriaceous, rough above with white cystoliths, more or less fulvous-pubescent beneath, feather-veined; petioles ·5″ long. Flowers white, tetrandrous, about ·2″ long, in short, lax, terminal or axillary, pubescent, pedunculate cymes; buds globose; peduncles about 1″ long; pedicels short or O. Calyx obconic, pubescent outside and with shining silky short hairs within; lobes short, obtuse. Corolla white, about ·2″ long; lobes 4, oblong, as long as the tube, reflexed. Filaments glabrous. Drupe ovoid, yellow, longitudinally striate, ·3″ long, apiculate, glabrous, seated on the loose, shallow, irregularly lobed calyx; stone 1-3-seeded, surrounded by yellow, gelatinous pulp.

Dry districts of the North-West, Central and Southern India, common in

Rajputana, dry regions of Ceylon; throughout the dry districts of the presidency but nowhere common often planted and self-sown along the bunds of tanks and near villages. Fl. Apl.-June. Fr. C. S.

Bark grey with deep, longitudinal furrows. Wood hard, grey, compact. Pores small, often subdivided. Medullary rays fine and moderate-sized crossed by concentric often anastomozing bands of light-coloured tissue. Weighs 42 lbs. to the cub. ft. Used in Sind for construction purposes and in Cutch for agricultural implements. A gum exudes from wounds in the bark and the inner-bark yields a strong fibre made into ropes. The pulp of the fruit is edible but insipid.

2. EHRETIA, Linn.

Small trees or shrubs. Leaves alternate or fascicled, entire or toothed. Flowers small, in axillary or terminal corymbs, rarely solitary. Calyx deeply 5-divided. Corolla rotate or subcampanulate; tube short; lobes imbricate in bud. Stamens 5, inserted on the corolla-tube; anthers usually exserted. Ovary 2-celled; cells 2-ovuled; style terminal, cylindric, bifid or bipartite or styles 2; stigmas small, capitate. Fruit a drupe with 4, 1-seeded pyrenes or 1, 4-celled pyrene; albumen scanty; cotyledons ovate or oblong not plaited.

Flowers in terminal or axillary, corymbose cymes.
Leaves large, alternate.
Leaves glabrous, shining above ... . 1. E. lævis.
Leaves scabrous and pubescent above, tomentose beneath ... ... 2. E. aspera.
Flowers axillary, solitary or in slender, pedicelled pairs.
Leaves small, fascicled ... ... 3. E. buxifolia.

1. E. lævis, Roxb. Cor. Pl. t. 56; Fl. Br. I. 4, 141; Dalz. & Gibs. Bomb. Fl. 170; Wight Ic. t. 1382; Bedd. Fl. Sylv. t. 246; Brandis For. Fl. 340; Cooke Fl. Pres. Bomb. 2, 204; Gamble Ind. Timb. 503. *Adak, bagari,* K. *Datrang,* M. *Tamboli,* Vern.

A small or medium-sized tree; branchlets glabrous or more or less pubescent. Leaves variable in shape, broadly ovate or elliptic, 1·5″-5″ by ·75″-3″, shortly acuminate or rounded at the apex, narrowed into the petiole, rounded or truncate at the base, thin, glabrous, shining above, paler beneath; lateral-nerves 6-8 pairs, curving upwards and uniting intramarginally, strong beneath and often glandular-tufted in the axils; petioles ·2″-1″ long. Flowers small, white, about ·25″ across, sessile or shortly pedicelled, in loose axillary or lateral corymbose glabrous or pubescent cymes 3″ long composed of unilateral spikes; peduncles ·25″-·5″ long; bracts O. Calyx ·05″ long, pubescent, 5-lobed; lobes ovate, acute. Corolla

rotate; tube longer than the calyx; lobes twice as long as the tube, ovate acute, oblong, spreading. Stamens exserted; filaments glabrous; anthers acute. Drupe depressed-subglobose, slightly 2-lobed, red, black when ripe, containing 3-4, 1-seeded triquetrous pyrenes in scanty pulp.

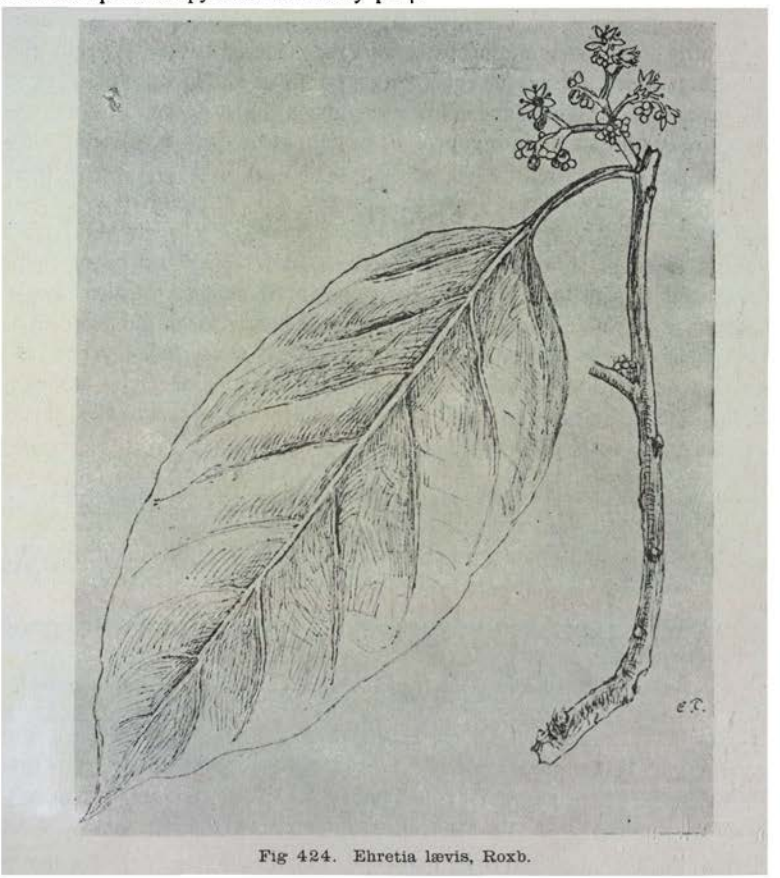

Fig 424. Ehretia lævis, Roxb.

Tropical and subtropical Asia, Polynesia and Australia; throughout the Bombay presidency in deciduous and moist monsoon-forest. The variety *canarensis* of this very variable species is common along the Konkan and N. Kanara ghâts; Var. *floribunda* is sometimes planted near Hindu temples in the Poona district. Fl. Jan. July. Fr. ripe Mch.-June.

Usually a small tree, sometimes not more than a small shrub. Bark grey, rather thick, smooth and scaly; inner-bark soft, white and without fibres. Wood greyish-white, hard, tough and durable. Annual-rings indistinct. Pores small, in

groups or radial lines. Medullary rays fine or very fine, short, distinct, somewhat irregularly spaced. Weighs about 35 lbs. to the cub. ft. The wood is used for agricultural implements and building purposes. The inner-bark mixed with flour is eaten in times of scarcity as well as the tasteless fruit.

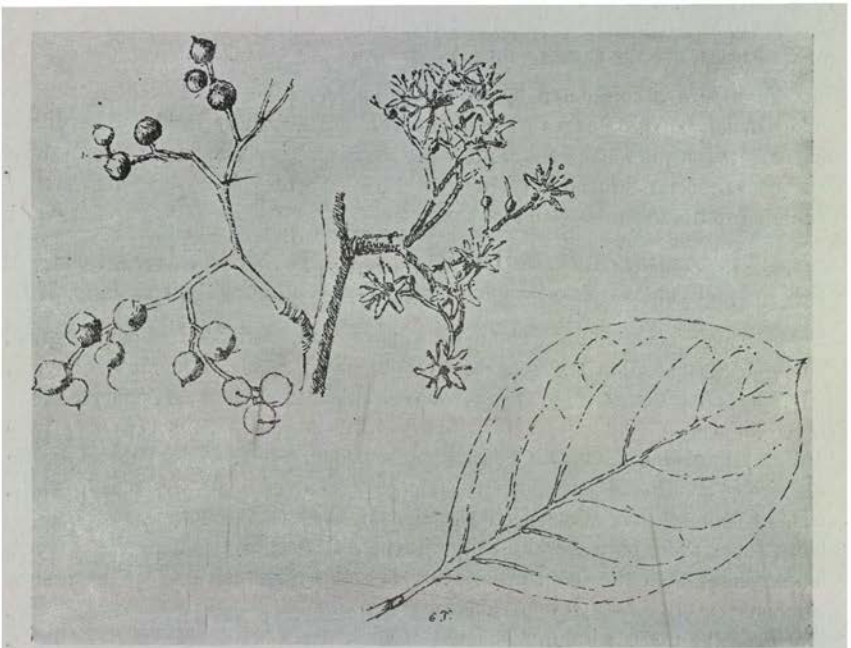

Fig 425. Ehretia lævis, Roxb.—*Fruit.*

2. E. aspera, Roxb. Cor. Pl. 1, 42, t. 55. Fl. Ind. 1, 598; Brandis For. Fl. 340; Cooke Fl. Pres. Bomb. 2, 204; Bedd. Fl. Sylv. 166; *E. lævis,* Var. *aspera,* C. B. C; Fl. Br. I. 4, 142; *Kupta, datrangi,* M. *Chambul,* Sind.

A small tree or large shrub; branches glabrous, grey, smooth and shining; branchlets downy. Leaves obovate, ·75″-3″ by ·5″-2″, obtuse or sometimes shortly acuminate at the apex, subacute at the base, coriaceous, scabrous (hairs with bulbous bases) above, persistently softly-pubescent beneath; lateral-nerves about 6 pairs strong beneath; petioles ·75″ long. Flowers white, ·25″ long, in short, lax, lateral pubescent, corymbose cymes; buds globose. Calyx ·1″ long, brown-tomentose outside; lobes ovate, acute, ciliate on the margins. Corolla twice as long or longer than the calyx; lobes ovate as long as the campanulate tube. Style nearly entire or shortly bipartite. Drupes depressed-globose, ·25″ in diameter; red, black, when ripe; pyrenes 4, angular, bony.

Dry regions of peninsular India from Beluchistan, the Punjab and Sind to the Southern Deccan. Abyssinia, Dry Deccan districts; common on the rocky slopes near Utur in the Poona district. Fl. March-May. The young leaves appear later in the season. Dr. T. Cooke in his Flora Bomb. Pres. 2, 204 considers *E. obtusifolia*, Hochst, to be a variety of this species. The economic uses of *E. aspera,* are the same as those of *E. lævis.*

E. aspera is considered by C. B. Clarke in the Fl. Br. I. and by several other Indian botanists as a variety of the variable *E. lævis,* Roxb. The differences between the foliage and flowers and habits of the two plants are I think specific. *E. lævis* is found in the moister forests whereas *E. aspera* is invariably confined to desert and barren stony regions.

3. E. buxifolia, Roxb. Cor. Pl. 1, 42, t. 57; Fl. Br. I. 4, 144; Bedd. Fl. Sylv. 167; Cooke Fl. Pres. Bomb. 2, 204; Trimen Fl. Ceyl. 3, 196. *Pala,* M.

A small bushy shrub; branchlets pubescent, strigose. Leaves small, numerous, fascicled on the suppressed branchlets, sessile, tomentose, obovate, ·3″-1″ by ·1″-·4″ obtuse or emarginate, obscurely lobed at the apex, cuneate at the base, coriaceous, scabrous, shining above with short, stiff hairs springing from white cystolithic bases, paler beneath with sparse, short, white pubescense on the strong midrib and lateral-nerves; margins recurved. Flowers small, white, axillary, solitary or in pairs; peduncles slender, hairy, 0-·3″ long. Calyx about ·1″ long; lobes ovate-obtuse, white-hairy without. Corolla campanulate, ·25″ across; lobes longer than the tube, ovate-acute or subobtuse, reflexed or spreading. Stamens exserted. Styles 2, exceeding the stamens. Drupe ovoid, ·1″ long, seated on the persistent calyx, pointed at the apex, shining, scarlet; pyrene 1, 4-celled.

Western peninsula, Malaya, Ceylon, Formosa and the Philippines; dry thorn-forest throughout the Deccan; common on the stony hills near Dharwar in the Southern Mahratta country. Fl. Jan.-Mch. and probably throughout the year. A small shrub of little importance.

3. RHABDIA, MART.

A shrub. Leaves small, alternate or clustered. Flowers small, in few-flowered, terminal racemes. Calyx 5-divided. Corolla pink; tube short; lobes 5, imbricate in bud. Stamens 5, inserted on the corolla-tube. Ovary 2-celled; cells each with 2 ovules; style long, simple; stigma capitate or minutely 2-lobed. Fruit a small drupe with 4, 1-seeded pyrenes. Seeds with scanty albumen; cotyledons small, ovate.

R. lycioides, Mart. Nov. Gen. & Sp. 2, 137, t. 195; Cooke Fl. Pres. Bomb. 2, 205; Gamble Ind. Timb. 504; *R. viminea,* Dalz. & Gibs. Bomb. Fl. 170; Brandis For. Fl. 341; *Ehretia cuneata,* Wight Ic. t. 1385. *Machim,* Vern.

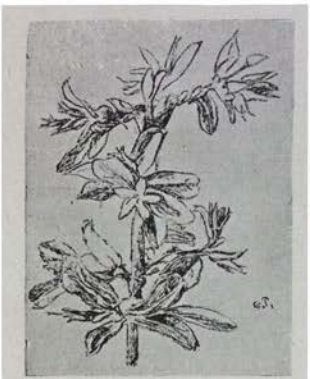

Fig 426. Rhabdia lycioides, Mart.

A bushy virgate, glabrous, corky-barked shrub; branchlets short, glabrous, shining or white pubescent. Leaves small, obovate-spathulate, alternate, crowded on the short, arrested branchlets, ·25″-·75″ by ·12″-·25″, rounded, emarginate or apiculate at the apex, cuneate at the base, coriaceous, glabrous shining, rarely white pubescent; lateral-nerves 4 pairs, obscure; petioles very short or O. Flowers pink, solitary or 2-3 together on short, axillary peduncles; bracts linear-lanceolate; pedicels very short. Calyx 5-divided to near the base; lobes ·25″ long, pubescent, imbricate, ovate, long-acuminate; the inner 2 shorter than the outer, slightly ciliate on the margins. Corolla about as long as the calyx-lobes; tube short; lobes ovate-obtuse, spreading. Stamens exserted beyond the corolla-tube; filaments ·12″ long. Style slender, longer than the calyx; stigmas usually 2. Fruit size of a pea, ovoid, tipped with the style and included in the persistent calyx, orange-coloured when ripe.

Tropical India from Kumaon and Assam to Tenasserim and Ceylon in the gravelly beds and along the banks of rapidly flowing streams and rivers; common in N. Kanara and the Konkan also in the Deccan. Fl. Oct-Dec. Fr. Jan.

Order LXIV.—CONVOLVULACEÆ.

Shrubs or herbs, mostly twining. Leaves alternate; (absent in *Cuscuta*); vernation conduplicate; stipules O. Flowers regular, bisexual, often large and showy, 1 or more together usually in axillary cymes; bracts more or less conspicuous. Calyx deeply 5-lobed or lobes free, imbricate, persistent, sometimes enlarged in fruit. Corolla usually campanulate or funnel-shaped, more or less deeply 5-lobed; lobes often plaited in bud. Stamens 5, inserted on the corolla-tube. Ovary superior often surrounded with an annular disk, 2-celled; cells each with 2 ovules or 4-celled by false dissepiments and each cell with 1 ovule; styles 1-2, rarely absent; stigmas capitate, 2-lobed or 2-branched. Fruit indehiscent, 2-4-valved, circumcissile or breaking up irregularly, 2-4 rarely 1-seeded. Seeds erect; albumen scanty, mucilaginous (fleshy in *Cuscuta*); cotyledons plaited (absent in *Cuscuta*).

An extensive Natural Order of small economic interest to the forester. Stems usually slender with wood of quite abnormal structure. Flowers mostly large and handsome. Three species of *Cuscuta*, twining greenish-yellow, parasitic annuals are found on trees and in hedges throughout the presidency.

Styles O.

Stigma subglobose. Fruit a 1-seeded berry ... 1. Erycibe.

Style 1, slender.

Stigmas 2, linear-oblong. Fruit irregularly breaking up ... ... 2. Rivea.

Stigmas 2, globose.

Fruit baccate, indehiscent.

Ovary 4-celled ... ... 3. Argyreia.

Ovary 2-celled ... ... 4. Lettsomia.

Fruit a 2 or more celled capsule.

Sepals not enlarged in fruit ... ... 5. Ipomœa.

Sepals enlarged in fruit ... ... 6. Porana.

Styles 2.

Bracts inconspicuous. Flowers medium-sized ... 7. Breweria.

Bracts large, orbicular, scarious, with the small sessile fruit in the centre. Flowers small ... 8. Neuropeltis.

1. ERYCIBE, ROXB.

Climbing or rambling shrubs. Leaves coriaceous, evergreen, entire. Flowers small in axillary or terminal racemes or panicles. Sepals subequal, coriaceous, adpressed to the base of the fruit. Corolla white or yellowish; tube short, campanulate; lobes 5, imbricate, each deeply cut into 2, plaited segments. Stamens 5, inserted at the base of the corolla-tube; anthers beaked. Ovary 1-celled with 4, erect ovules; stigma large, sessile. Fruit a fleshy, 1-seeded, ovoid or ellipsoid berry; albumen scanty; cotyledons plicate; radicle inferior.

E. paniculata, Roxb. Fl. Ind. 1, 585; Fl. Br. I. 4, 180; Dalz. & Gibs. Bomb. Fl. 168; Brandis For. Fl. 344; Cooke Fl. Pres. Bomb. 2, 225; Gamble Ind. Timb. 505; Var. *Wightiana*; *E. Wightiana,* Grah. Cat. Bomb. Pl. 137; Wight Ill. t. 180; Trimen. Fl. Ceyl. 3, 205; Dalz. & Gibs. Bomb. Fl. 170; Brandis For. Fl. 344. *Ankole, sengar-balli.* K.

A large, evergreen climbing shrub; branches angular, glabrous, lenticellate; branchlets reddish-brown tomentose. Leaves ovate or elliptic-oblong, 2·5″-5″ by 1·25″-2·5″, shortly acuminate and acute sometimes apiculate at the apex, acute at the base, coriaceous, glabrous shining; lateral-nerves about 6 pairs, slender, distinct, looping within the margin; petioles ·25″-·5″ long. Flowers small, yellow or white, in terminal or axillary, interrupted, bracteate racemes 1″-6″ long; buds globose; pedicels about ·1″ long, rusty-pubescent; bracts linear or ovate, short, caducous. Calyx deeply 5-divided; lobes ·12″ long, rounded, imbricate, silky-tomentose, ciliate. Corolla rotate, ·3″ across; tube short, rusty-tomentose outside; lobes 5, fleshy, each with 2 rounded, yellow, folded, obtuse lobules at the tip. Filaments with a broad base; anthers curved, apiculate. Ovary globose, glabrous. Berry ellipsoid, fleshy, black, about ·5″ long, supported by the 5-lobed, rusty-pubescent calyx.

Throughout India from Oudh eastwards and southwards to Ceylon, ascending to 4000′ in the Himalaya, rare in the Bombay presidency. The variety *Wightiana* with white, fragrant flowers, considered by Brandis in his Indian Trees a separate species is the form commonly found in the Konkan and N. Kanara mostly in rain-forest along the ghâts. Fl. June-Dec. Fr. ripe from March onwards.

Stems scarcely exceeding 1″ in diameter. Bark dark-coloured, thin, covered with rough lenticels. Wood soft, white, porous, of abnormal structure. Gamble describes the wood as a series of xylem wedges round a central pith, each surrounded with a layer of phlœm-tissue then several separate round concentric masses of xylem enclosed in phlœm, these gradually getting smaller outwards.

2. RIVEA, CHOISY.

Climbing or suberect, straggling shrubs. Leaves cordate, silky or tomentose beneath; petioles long. Flowers few (1-7) on axillary peduncles; bracts 2-3, short, narrow. Sepals 5, ovate or oblong, subequal. Corolla large, white with a long cylindrical tube and a wide mouthed, funnel-shaped, plaited limb. Stamens included. Ovary 4-celled; ovules 4; disk annular; stigmas linear-oblong. Fruit subglobose, nearly dry, shining, indehiscent or irregularly breaking up. Seeds 1-4, glabrous, immersed in mealy pulp.

Erect straggling shrub. Leaves white-tomentose beneath ... ... 1. R. ornata.

Climbing shrub. Leaves silky beneath ... 2. R. hypocrateriformis.

1. R. ornata, Choisy, Convolv. Orient. 27, t. 3; in Mem. Soc. Phys. Genev. 6, 409; Fl. Br. I. 4, 183; Wight Ic. t. 1356; Cooke Fl. Pres. Bomb. 2, 254; Dalz. & Gibs. Bomb. Fl. 168; *Argyreia ornata,* Sweet.; Brandis For. Fl. 343; *Lettsomia ornata,* Roxb. Fl. Ind. 1, 496. *Phand,* M.

Usually a stout erect straggling shrub; branches rather thick, somewhat flattened, finely silky-pubescent. Leaves orbicular, 2″-3″ long and as broad or sometimes slightly broader, obtuse, emarginate or apiculate at the apex, widely cordate at the base, coriaceous, glabrous above, densely white-tomentose beneath; basal-nerves strong beneath; petioles 1·5″-2·5″ long, stout, silky-tomentose. Flowers white, scented, axillary, tomentose, articulate at the base, usually in threes on short, stout, tomentose peduncles; pedicels ·5′ long, stout. Calyx-lobes ovate-lanceolate, acute, ·75″ long, thick and fleshy, in fruit with dry scarious margins, tomentose outside. Corolla-tube 1·5″ long, silky without; limb 2″ across with shallow, emarginate lobes. Filaments hairy at the base; anthers not ultimately twisting. Fruit subglobose, ·6″ in diameter, mucronate by the base of the style, light, polished brown; seeds 1-4, glabrous, ovoid, ·2″ in diameter, enclosed in a white, spongy substance.

Throughout the Western peninsula in dry forests, rare in the Bombay presidency, Deccan hills ascending to 3700′ in the Khandesh Akrani. Dalzell found it on the hills west of Junnar in the Poona district and it has also been collected in the Konkan. Fl. R. S. Fr. C. S. Stems usually erect, 3″-4″ in diameter. Bark light-coloured, corky. Flowers fragrant, opening during the night.

2. R. hypocrateriformis, Choisy, Convolv. Orient, 6, 409; Fl. Br. I. 4, 184; Cooke Fl. Pres. Bomb. 2, 254; Dalz. & Gibs. Bomb. Fl. 168; Grah. Cat. Bomb. Pl. 127; Trimen Fl. Ceyl. 3, 205; *R. bona-nox,* Roxb. Hort. Beng. 13; *Argyreia bona-nox* and *uniflora,* Sweet.; Brandis For. Fl. 343. *The Midnapore Clove-scented creeper; Kulmiluta, phanji,* Vern.

A large climbing and twining shrub; branches terete, slender, silky-pubescent. Leaves orbicular, 1″-2·5″ long and as broad or sometimes broader, obtuse acute or emarginate with the midrib excurrent at the apex, broadly cordate at the base, glabrous above, more or less adpressed silky-pubescent beneath; petioles 1″-2″ long. Flowers white, fragrant, opening in the evening after sunset; peduncles usually short, axillary and 1-flowered; bracts linear, pubescent, caducous, at the base of the peduncle. Calyx-lobes unequal about ·3″ long, broadly ovate, obtuse, silky on the outside. Corolla-tube narrow, 1·5″-2·5″ long, glabrescent outside; limb 2″ across, glabrous or sparsely silky. Stigmas ·12″ long, linear-oblong. Fruit depressed-globose, ·5″ in diameter, polished chestnut-brown, crowned with the remains of the style; dehiscence circumcissile.

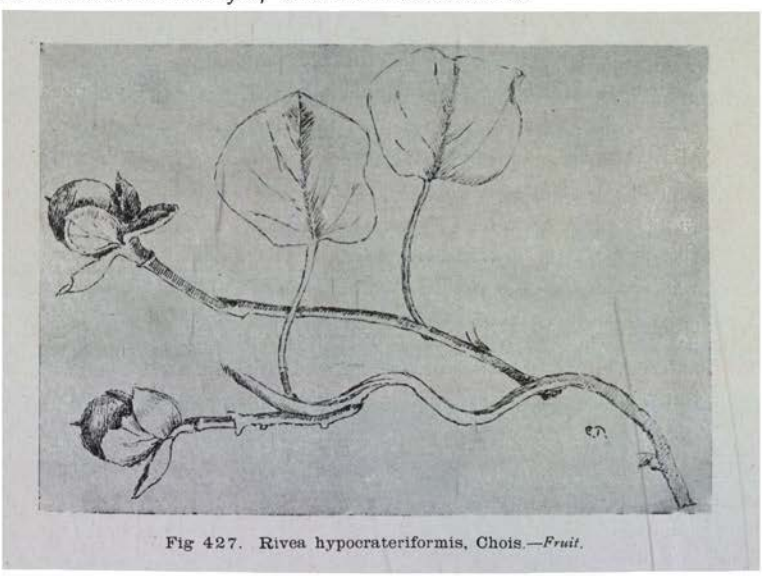

Fig 427. Rivea hypocrateriformis, Chois.—*Fruit.*

Western India, Assam; common in deciduous forests throughout the presidency and Sind, often in hedges, absent from the rain-forest formation. Fl. R. S. Aug.-Oct. Fr. Sept.-Dec. Leaves and young shoots are sometimes eaten as a vegetable.

3. ARGYREIA, Lour.

Large twining or prostrate rarely erect shrubs. Leaves usually silky or pubescent beneath. Flowers large, purple or rose-coloured rarely white, in axillary cymes; bracts often leafy, deciduous or persistent. Sepals herbaceous, subequal, orbicular, ovate or lanceolate scarcely enlarged in fruit. Corolla

usually campanulate; limb plicate, shortly lobed. Stamens included. Ovary completely 4-celled; cells each with one ovule; disk annular; style filiform; stigmas 2, globose. Fruit baccate or nearly dry, hard or papery, indehiscent. Seeds 4-1, enclosed in mealy pulp.

Climbing shrubs.
- Bracts deciduous.
  - Leaves white-tomentose beneath ... ... 1. A. speciosa.
  - Leaves glabrous beneath ... ... 2. A. Hookeri.
- Bracts persistent.
  - Bracts broad, unequal, sparsely hairy and without parallel nerves ... ... 3. A. involucrata.
  - Bracts broad, not very unequal, densely white-silky beneath with 3-5 strong, parallel nerves ... 4. A. sericea.
  - Bracts linear, pubescent ... . 5. A. Lawii.
  - Bracts small, rounded orbicular, softly tomentose 6. A. cymosa.

Procumbent or climbing shrub.
- Bracts linear, persistent, strigose with bulbous-based hairs ... ... 7. A. pilosa.

Erect shrub. ... ... 8. A. cuneata.

1. A. speciosa, Sweet, Hort. Brit. Ed. 2, 373; Fl. Br. I. 4, 185; Dalz. & Gibs. Bomb. Fl. 168; Brandis For. Fl. 343; Cooke Fl. Pres. Bomb. 2, 255; Gamble Ind. Timb. 506. *The Elephant Creeper. Samudra-shoka, guguli,* Vern.

A large climber; branches white-tomentose. Leaves ovate-rotundate, 3″-12″ long by nearly as broad, acute or apiculate at the apex, cordate at the base, glabrous above, white-tomentose beneath; petioles 2″-6″ long, tomentose. Flowers in long-peduncled, subcapitate, few-flowered cymes; peduncles as long as the petioles, white-tomentose; bracts large, ovate-lanceolate, long-acuminate, ·5″-1·5″ long, white-woolly, deciduous. Sepals ovate, obtuse, ·5″ long, white-tomentose. Corolla tubular, funnel-shaped, 2″-3″ long with a purple, glabrous centre; tube and bands silky outside. Fruit globose, ·75″ in diameter, enclosed in the accrescent, imbricate, coriaceous sepals.

Found all over tropical India from Assam to Belgaum and Mysore, considered to be indigenous in Bengal, commonly cultivated in gardens for its handsome flowers; throughout the Deccan and near the coasts of N. Kanara and the Konkan often in moist forests and in open situations near villages; doubtfully indigenous. Fl. Aug.-sept. Fr. Dec.

Stems 3″-4″ in diameter. Bark light-coloured, thin, flakey. " Wood grey, in concentric rings divided by belts of bast tissue alternating with woody belts which

latter are again divided into wedges by broad medullary rays. Pores few, large, in groups in the tissue between the medullary rays." Gamble.

2. A. Hookeri, C. B. C. in Fl. Br. I. 4, 185; Cooke Fl. Pres. Bomb. 2. 255; Brandis Ind. Trees, 485; *A. zeylanica,* Kz. Var. *populifolia; A. malabarica,* Woodrow in Jour. Bomb. Nat. Hist. Soc. 12. 170 (not of Choisy).

A large climber; branches slightly pubescent. Leaves ovate-orbicular, 3·5″-10″ by 3″-9″, acute or shortly acuminate at the apex, shallow cordate or rounded at the base, membranous, glabrescent or thinly pubescent on the nervation beneath; lateral nerves 10-12 pairs, lower 2-3 pairs basal, distinct beneath; petioles 2″-5″ long, lenticellate, glabrescent. Flowers axillary, in long-peduncled capitate, few-flowered cymes; peduncles 3″-6″ long, more or less white-tomentose; pedicels ·2″ long; bracts linear-oblong, ·75″-1″ by ·3″, often apiculate, glabrous or pubescent, caducous. Sepals ·3″-·5″ long, narrowly ovate, acuminate; outer longer and narrower than the inner, covered with scattered white hairs on the outside; margins thin. Corolla rose-coloured, 2″-2·5″ long; mouth wide; lobes acute, sparsely hairy on the tube and bands outside. Filaments hairy at the base; anthers obtuse. Style long, filiform. Fruit a globose berry ·75″ in diameter.

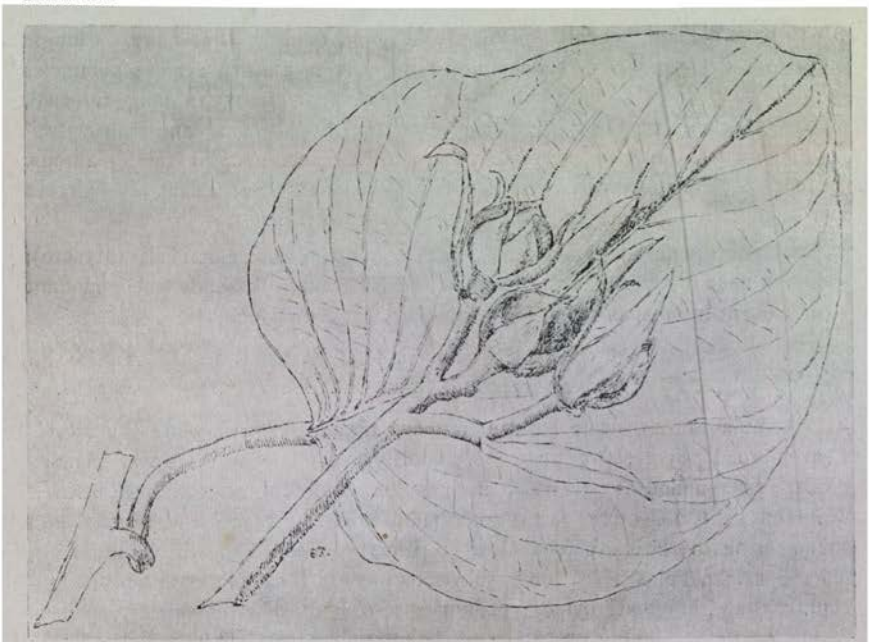

Fig 428. Argyreia Hookeri, C. B. Clarke.

Assam, Sikkim, Bhutan and the Western peninsula; common on the Mahableshwar plateau at 4500′. Fl. Aug.-Sept. Fr. C. S.

Stems up to 3″ in diameter, usually twisted and deeply fluted, often more or less flattened. Bark thin, grey or brownish, rough with horizontal lenticels. Wood of very irregular and abnormal structure. Concentrically arranged round the pith which is usually very excentric are angular or rounded patches of xylem, consisting of soft, grey tissue containing numerous large oval, mostly undivided pores. These patches of xylem are enclosed in complete or broken rings of irregular thickness of bast tissue. The fine wavy medullary rays are very irregularly distributed in the xylem. It is difficult to properly describe the structure of the woods of the *Convolvulaceæ*, and they would be better understood from illustrations.

3. A. involucrata, C. B. Clarke in Fl. Br. I. 4, 187; Cooke Fl. Pres. Bomb. 2, 256; Brandis Ind. Trees, 484.

A large twining or prostrate shrub; branchlets adpressed grey-pubescent. Leaves broad, ovate-lanceolate, 3″-7″ by 1·75″-4, shortly acuminate or acute at the apex, rounded or shallow cordate at the base, thin, dark-green often purple, glabrous above, adpressed white-hairy on the nervation beneath; lateral-nerves 10-12 pairs distinct, beneath; petioles 1″-4″ long, densely white-hairy. Flowers purple in long-peduncled, subcapitate, few-flowered, axillary cymes; peduncles 3″-4″ long; pedicels ·2″ long; bracts narrowly ovate, leafy, ·75″-2″ long, unequal, persistent, glabrescent or sparsely hairy beneath. Sepals ovate-lanceolate, ·3″-·6″ long, unequal, the 3 inner broader than the 2 outer; margins thin, glabrous. Corolla 2″-3″ long, sparsely covered with long hairs outside. Filaments hairy at the base. Fruit globose, ·5″ in diameter, yellow when ripe.

Western peninsula, Konkan, N. Kanara, and the Bababudan hills (Mysore); common near the coasts of the Konkan and N. Kanara on sandy soil, abundant near Karwar in open situations. Fl. July-Aug. Fr. Nov.-Dec.

4. A. sericea, Dalz. & Gibs. Bomb. Fl. 169; Fl. Br. I. 4, 188; Cooke Fl. Pres. Bomb. 2, 256; *Ipomœa bracteata*, Grah. Cat. Bomb. Fl. 131. *Gavel*, M.

A twining or prostrate shrub; branches terete, yellowish-white tomentose. Leaves broadly ovate, 4″-5″ by 3·5″-4″, shortly acuminate at the apex, shallow-cordate or rounded at the base, more or less thinly strigose with adpressed white hairs above, (hairs with small bulbous bases) densely white-silky and shining beneath; lateral-nerves about 10 pairs, prominent beneath, the lower 2-3 pairs basal; petioles 1″-2″ long, silky-tomentose. Flowers 2-6, in long-peduncled, capitate, bracteate cymes; peduncles 1″-6″ long, silky-tomentose; pedicels very short or 0, bracts ovate-acute or linear-oblong, ·5″-1″ by ·2″-·5″, densely silky-tomentose and with 3-5 strong, prominent basal-nerves. Sepals ovate-

acute, ·5″ long, hairy outside, the 2 outer larger than the 3 inner. Corolla pink, 2·5″ long, tubular funnel-shaped; tube and bands sparsely hairy. Filaments hairy at the base. Berry globose, ·5″ in diameter, yellow when ripe.

Western peninsula, frequent on the Deccan and Konkan ghàts, rare in N. Kanara. Fl. Sept.-Oct. Fr. C. S. A handsome flowering and foliage plant worth introducing into gardens.

5. A. Lawii, C. B. Clarke in Fl. Br. I. 4, 190; Cooke Fl. Pres. Bomb. 2, 257.

A twining shrub; branches softly silky. Leaves ovate-acute, 3″-5″ by 2″-3″, acute or acuminate at the apex, rhomboid or rounded at the base, softly strigose on both sides, more or less silvery-white beneath; petioles 1″-2″ long. Flowers in long-peduncled, dense, few-flowered, trichotomous cymes; bracts narrowly oblong, acute, pubescent, ciliate; peduncles 2″-5″ long; pedicels very short. Sepals ovate-acute, ·25″ long, hairy. Corolla 2″ long, tubular-campanulate, hairy on the outside. Fruit undescribed.

Doubtfully indigenous in the Bombay presidency. There is only one sheet of this species in the Kew herbarium marked "North and South Konkan" Law. In the Fl. Br. I. the Konkan, Malabar and the Bababudan hills are given as its habitat.

6. A. cymosa, Sweet, Hort. Brit. Ed. 1, 289; Fl. Br. I. 4, 190; Cooke Fl. Pres. Bomb. 2, 257; Wight Ic. t. 839.

A scandent climbing shrub; branches slender, grey-pubescent. Leaves broadly ovate, 2″-4″ by 2″-3″, acute or shortly acuminate at the apex, cordate or rounded at the base, pubescent above, adpressed hairy beneath; lateral-nerves 6-8 pairs, lower 2-3 pairs basal, strong beneath, petioles 1·5″-3″ long. Flowers in dense, long-peduncled, bracteate heads arranged in panicles or corymbs; bracts orbicular, ·5″ in diameter, tomentose, with a midrib and 2-4 pairs of lateral nerves strong beneath; peduncles axillary, 2″-6″ long, pubescent. Calyx white-tomentose; sepals obovate, obtuse, about ·5″ broad the two inner narrower. Corolla tubular-campanulate, 2″ long, lilac, more or less hairy on the tube and bands outside. Stamens not exserted. Fruit globose, ·75″ in diameter, fleshy, enclosed in the slightly accrescent calyx.

Deccan peninsula, common in the Kistna and Bellary districts of the Madras presidency, rare in Bombay, apparently only collected by Law in the Konkan. It might be looked for in the dry parts of Belgaum and Bijapore. Fl. C. S. Jan.-Mch.

A. malabarica, Choisy, Convolv. Orient. DC. Prodr. 8,331; Dalz. & Gibs. Bomb. Fl. 169; Grah. Cat. 128; Rheede Hort. Mal. 11, t. 51; *Convolvulus malabaricus,* Linn. is a doubtful species founded on Rheede's plate in the Hortus

Malabaricus. I am disposed to agree with Woodrow who considered the common ghàt species now referred to *Argyreia Hookeri,* C. B. Clarke to be the plant described by Graham and Dalzell.

7. A. pilosa, Arn. in Pugill. Pl. Ind. Or. 38; Fl. Br. I. 4, 189; Cooke Fl. Pres. Bomb. 2, 257. *Ugri-bali,* K.

A large twining or prostrate shrub; branches terete, substrigose with yellowish-brown hairs from bulbous bases. Leaves ovate, 3″-8″ by 1·25″-4″, acute or shortly acuminate at the apex, subcordate or rounded at the base, hairy or substrigose on both sides, ultimately glabrescent above, (hairs with white bulbous bases); lateral-nerves 6-8 pairs, prominent beneath; petioles 1″-3″ long, pubescent. Flowers in long or short-peduncled, axillary, few-flowered, capitate cymes; bracts linear, persistent, ·5″-1″ long, pubescent. Sepals linear-acute, about ·5″ long not very unequal. Corolla funnel-shaped, 2″ long, purple, hairy outside on the tube and bands. Fruit globose, ·5″ in diameter, yellow when ripe; seeds 2-4, ovoid, ·3″ long, glabrous.

Western peninsula in shady places and along the banks of nallahs throughout the moist monsoon-forests of the Konkan, N. Kanara and Mysore. Fl. R. S. during Sept.-Oct. Fr. H. S. It is remarkable that this locally common species is noted by neither Graham nor Dalzell. Stems usually slender, irregularly grooved. Bark brown, rough lenticellate. The wood of *A. hirsuta*, Arn. a closely allied thick-stemmed species, of abnormal structure common in the Nilgiris has a large central angular pith enclosed in a complete narrow ring of white phlœm. Outwards concentrically arranged are broad belts of soft xylem containing many large subdivided pores, whilst surrounding the xylem are wavy narrow bands of white phlœm. The whole mass being subdivided into irregular wedges by the broad medullary rays. Medullary rays very irregularly broad and fine.

8. A. cuneata, Ker-Gawl. in Bot. Reg. t. 8, 661; Fl. Br. I. 4, 191; Brandis For. Fl. 344; Cooke Fl. Pres. Bomb. 2, 258. *Mahalungi,* Vern. *Kalkuka-gidda,* K.

An erect, low, much branched shrub; branchlets densely grey silky-pubescent. Leaves obovate, 1·5″-3″ by ·6″-1·25″, obtuse, emarginate or apiculate at the apex, cuneate at the base, coriaceous, glabrous above, adpressed grey silky-hairy beneath; lateral-nerves about 8 pairs inconspicuous; petioles ·1″-·25″ long. Flowers in axillary, 1-6-flowered, peduncled cymes; peduncles ·75″-1·5″ long; pedicels as long as the peduncles; bracts small, linear, hairy. Sepals broadly ovate, ·2″ long, accrescent in fruit. Corolla tubular-campanulate, about 1″ long, deep-purple, glabrous or slightly hairy on the bands outside. Filaments dilated and hairy at the base. Fruit ellipsoid, ·5″ long, pointed, light-brown shining, seated on the accrescent calyx.

Deccan peninsula; throughout the dry districts of the presidency on hard dry soil, often gregarious in open formation, sometimes twining when it meets with support. Fl. Aug.-Sept. Fr. C. S. Flowers used in Hindu religious ceremonies. Cultivated in gardens.

4. LETTSOMIA, Roxb.

Climbing, usually hairy shrubs. Leaves with a rounded or cordate base. Flowers in peduncled axillary, dense, bracteate cymes; bracts persistent or deciduous. Sepals 5, orbicular, elliptic or oblong, enlarged in fruit. Corolla funnel-shaped, plaited in bud. Stamens included or exserted; anthers finally twisted. Disk annular. Ovary 2-celled; cells 2-ovuled. Fruit a dry, indehiscent, 1-4-seeded berry.

Corolla small. Stamens exserted	1.	L. aggregata.
Corolla larger. Stamens included.		
Corolla nearly glabrous. Fruit dark-orange ...	2.	L. elliptica.
Corolla densely hairy or strigose. Fruit red ...	3.	L. setosa.

1. L. aggregata, Roxb. Fl. Ind. 1, 488; Fl. Br. I. 4, 191; Cooke Fl. Pres. Bomb. 2, 259; *Argyreia aggregata*, Choisy; Dalz. & Gibs. Bomb. Fl. 169; Grah. Cat. Bomb. Pl. 128. *Bond-vel*, M.; *Buden-bally*, K.

A large climbing shrub; branches densely white or yellowish-tomentose. Leaves ovate, 2″-5″ by 1·75″-4″, obtuse, often apiculate at the apex, cordate at the base, coriaceous, glabrous above, densely white-tomentose beneath; lateral-nerves about 10 pairs, the lower 2-3 basal, prominent beneath; petioles 1″-3″ long, stout, tomentose. Flowers small, ·5″ long, sessile or shortly pedicelled, crowded in peduncled, branched, capitate cymes; peduncles 1″-4″ long, stout, grooved, tomentose; bracts large, broadly ovate, obtuse, silky-tomentose outside, subpersistent. Sepals obovate, ·2″ long, densely tomentose outside, accrescent and red, glabrous, shining in fruit. Corolla tubular-campanulate, pink, about ·5″ long; tube glabrous; lobes oblong, emarginate as long as the tube, furnished with densely hairy bands on the outside. Stamens exserted; filaments hairy at the base. Style shorter than the stamens. Fruit globose, ·25″ in diameter, red, smooth, enclosed in the glabrous shining, concave, red sepals; seeds 1-4, smooth, light-coloured.

Deccan peninsula frequent; common in the dry districts of the presidency, often in hedges and in dry open places near deciduous forests. Fl. Aug.-Sept. Fr. Jan.-Feb.

Stems fluted, up to 2″ in diameter. Bark thin and smooth. Wood consisting of concentric rings, (often incomplete) of light-coloured xylem containing

numerous large, simple or divided pores; the xylem is enclosed in narrow bands of dark-brown, soft medullary tissue. Medullary rays broad, dark-brown.

2. L. elliptica, Wight Ic. 4, part 2, 12; Fl. Br. I. 4, 192; Cooke Fl. Pres. Bomb. 2, 259; *Argyreia elliptica,* Choisy; Dalz. & Gibs. Bomb. Fl. 169. *Bondvel, sonariel, khedari,* M.

A large slender-stemmed, leafy, twining shrub; branches nearly glabrous; young parts brown-pubescent. Leaves elliptic-lanceolate, 3″-5″ by 1″-2·5″, acute at apex and base, sub-coriaceous, thinly adpressed-hairy on both sides; lateral-nerves 7-10 pairs, parallel, very oblique, prominent beneath. Flowers purple, 1·5″ long in peduncled, axillary, capitate, few-flowered, bracteate cymes; peduncles slender, tomentose, 1″-4″ long; bracts small, caducous. Sepals ovate, ·25″-·3″ long, rounded or subacute, brown-pubescent outside with thin, glabrous margins. Corolla-tube 1″ long, glabrous; limb very shortly lobed about 2″ across with slightly hairy bands. Stamens included; filaments dilated, hairy at the base. Fruit globose, ·3″ in diameter, orange-yellow, shining, seated on the slightly accrescent calyx.

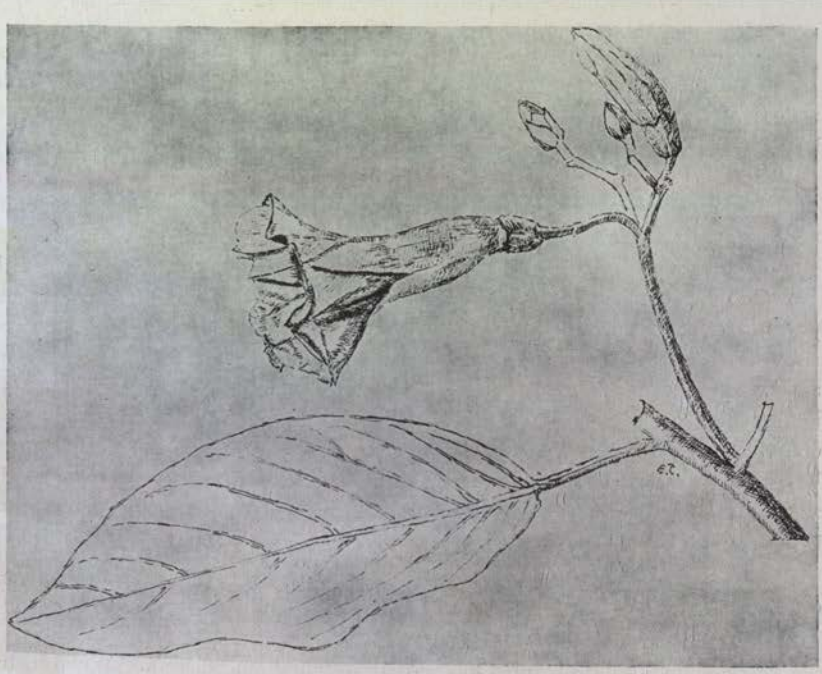

Fig 429. Lettsomia elliptica, Wight.

Deccan peninsula, Ceylon; common on the Konkan and N. Kanara ghâts in moist monsoon and rain-forest. Fl. Sept.-Nov. Fr. C. S. A handsome flowering species.

3. L. setosa, Roxb. Fl. Ind. 1, 490; Fl. Br. I. 4, 194; Cooke Fl. Pres. Bomb. 2, 260; *Argyreia setosa,* Choisy; Brandis For. Fl. 343; Dalz. & Gibs. Bomb. Fl. 168. *Dudh-vel, sambhar-vel,* M.

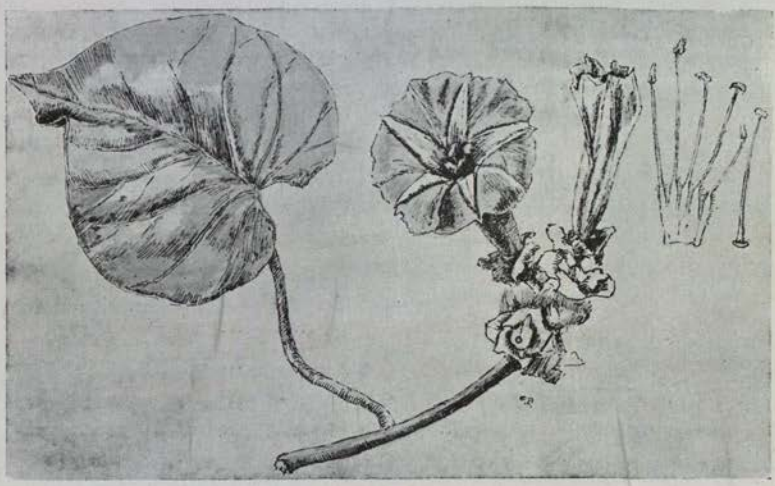

Fig 430. Lettsomia setosa, Roxb.

A large twining shrub with adpressed hairy branches. Leaves broad-ovate, 2″-4″ by 1·5″-4″, acute or shortly acuminate at the apex, broadly cordate at the base, coriaceous, sparsely hairy on both sides, hairs with bulbous bases; lateral-nerves about 10 pairs usually not prominent; petioles 1″-2″ long. Flowers in peduncled, corymbose, many-flowered, bracteate cymes; bracts ovate obtuse, ·25″ long, grey-strigose, caducous; peduncles 2″-6″ long, stout, white or grey-strigose. Sepals broad-ovate, ·5″ long, obtuse, thick, white-strigose. Corolla rose-coloured, ·75″-1·25″ long; tube contracted within the calyx and there glabrous, outside calyx it is clothed with dense white-hairs on the bands. Stamens included; filaments with broad, hairy bases. Fruit ovoid, ·5″ long, red, succulent, 2-4-seeded.

Var. *minor*, C. B. Clarke in Fl. Br. I. 4, 194 with small leaves and small capitate flowers on 1″ long peduncles is found in the Konkan.

Throughout tropical and subtropical India from Oudh and Bombay to Pegu and Ceylon; common in the Deccan and Konkan, often in hedges and open places in monsoon-forest from the sea-coast inland.

5. IPOMÆA, LINN.

Annual or perennial twining or prostrate herbs, rarely shrubs, seldom erect. Leaves simple or rarely compound-digitate. Flowers purple, white or yellow usually large and showy, in axillary cymes. Sepals 5, ovate or linear, equal or unequal. Corolla bell or funnel-shaped; limb 5-plaited; bands usually with 2 prominent lines. Stamens unequal, included or exserted not connivent over the ovary; pollen usually echinulate. Ovary 2-celled, 4-ovuled, rarely 4-celled and 4-ovuled or 3-celled and 6-ovuled; style filiform; stigmas 2, globose. Fruit a dry, 4-6-valved, dehiscent capsule. Seeds glabrous, woolly, velvetty or bearded.

Leaves simple.
- Seeds villous, furred or woolly.
  - Corolla large, salver-shaped, white; tube linear.
    - Seeds shortly villous ... ... 1. I. grandiflora.
  - Corolla middle-sized, pink or purple.
    - Leaves 5-7-palmately lobed. Seeds with long wool ... ... 2. I. digitata.
    - Leaves entire or sinuate. Seeds furred ... 3. I. sepiaria.
  - Corolla small, campanulate, pink. Seeds with short silky hairs ... ... 4. I. staphylina.
  - Corolla large, campanulate, white with a purple centre. Seeds with long brown-silky hairs ... 5. I. campanulata.
  - Corolla middle-sized, tubular funnel-shaped, white. Seeds with long patent hairs ... 6. I. cymosa.
- Seeds glabrous.
  - Twining shrubs.
    - Corolla large, white ... ... 7. I. Turpethum.
    - Corolla middle-sized, sulphur-yellow ... 8. I. vitifolia.
  - Seeds villous.
    - Prostrate, creeping shrub. Corolla large, purple 9. I. biloba.

Leaves compound or very nearly so with 5 palmate leaflets ... ... 10. I. palmata.

1. I. grandiflora, Lamk. III. Gen. 467 (not of Roxb.); Fl. Br. I. 4, 198; (in part.) *I. longiflora*, R. Br. Prodr. 484; Cooke Fl. Pres. Bomb. 4, 198; Rheede Hort. Mal. 9, t. 50.

A large climber with cylindrical or grooved, muricate or sometimes smooth stems. Leaves ovate-orbicular, entire, 3″-7·5″ by 3·5″-7″, acute or shortly

abruptly acuminate at the apex, deeply cordate at the base, thin, glabrous; lateral-nerves about 6 pairs, scarcely prominent; petioles 3″-6″ long, glandular at the apex. Flowers very large, white, on 1-3-flowered, bracteate, swollen, glabrous peduncles; bracts small, caducous; peduncles 0″-4″ long. Sepals ovate, obtuse or acute, about 1″ long, enlarged in fruit. Corolla-tube linear, 3″ long; limb 3·5″ in diameter. Stamens not exserted. Capsule globose, about 1″ in diameter, seated on the accrescent calyx, apiculate; peduncles much thickened; seeds ovoid, ·4″ long, densely shortly brown-villous with a brown, shaggy marginal fringe.

Western Deccan peninsula, usually near the sea-coast, Ceylon, N. Kanara in monsoon-forest and along the banks of nallahs; very rare, often cultivated. Fl. R. S. Sept.-Oct.

2. I. digitata, Linn.; Meissn. in Mart. Brasil. 7, 278; Cooke Fl. Pres. Bomb. 2, 249; Trimen Fl. Ceyl. 3, 212; *Batatus paniculata,* Choisy; Dalz. & Gibs. Bomb. Fl. 167. *Bhuikohola, vidarikand,* M.

A glabrous, perennial climber with round glaucous stems and branches and large tuberous roots. Leaves broad, palmately 5-7-lobed, 2″-5″ long and as broad or broader, cordate at the base; lobes ovate-lanceolate, shortly acuminate; nerves 5-7 basal, prominent beneath; petioles 1″-5″ long. Flowers in long-peduncled, many-flowered paniculate, bracteate cymes; bracts very small, caducous. Sepals ovate, ·25″ long, acute, glabrous, with thin margins. Corolla 1·5″-2″ long, campanulate, purple, glabrous. Capsule globose, ·3″ in diameter; seeds with long brownish woolly or cottony hairs.

Tropical India from Bengal and Assam to Ceylon, absent from the dry zone of Western India; throughout the Konkan and N. Kanara near the sea-coast in moist monsoon-forest. Fl. R. S. Aug.-Sept. "The juice of the root is much used in native medicine for increasing the flow of milk and other secretions." Trimen.

3. I. sepiaria, Kœn.; Roxb. Fl. I. 1, 500; Cooke Fl. Pres. Bomb. 2, 246; Dalz. & Gibs. Bomb. Fl. 166; Wight Ic. t. 838; Trimen Fl. Ceyl. 3, 220; *Amtivel,* M.

A glabrous or somewhat pubescent perennial twiner with slender stems. Leaves triangular-ovate, 2″-3·5″ by ·75″-2·5″, obtuse or emarginate at the apex, broadly cordate at the base with rounded lobes; thin, glabrous, margins sinuate; petioles slender, 1″-2″ long. Flowers medium-sized, in long-peduncled, subumbellate or corymbose often many-flowered, bracteate cymes; bracts small, lanceolate, caducous. Sepals broadly ovate, obtuse, the 2 outer shorter than the 3 inner, about ·25″ long; margins thin. Corolla salver-shaped, pale-purple or white outside; tube violet or purple within, 1″ long; limb 1·25″ across; mouth suddenly

widened; lobes acute, apiculate. Capsule ovoid, glabrous, ·4″ long; seeds grey with adpressed silky pubescence.

Throughout tropical India, the Malay peninsula and Ceylon; common in hedges everywhere, very abundant near the sea-coast. Fl. R. S. Aug.-Oct.

Var. *stipulacea,* C. B. C. (l. c.) with smaller, angled or sagittate leaves and smaller flowers is found in various situations, generally in dry districts.

4. I. staphylina, Rœm. & Sch. Syst. 4, 249; Fl. Br. I. 4, 210; Trimen Fl. Ceyl. 3, 219; Cooke Fl. Pres. Bomb. 2, 247.

A perennial twiner with stout, straggling stems; branches glabrous often grooved and warted. Leaves ovate, 2″-4″ by 1·5″-3″, acute at the apex, very shallowly cordate at the base, thin, glabrous; lateral-nerves about 8 pairs, distinct beneath; petioles 1″-2″ long. Flowers rather small for the genus in many-flowered, lateral, lax, peduncled, bracteate, paniculate cymes; peduncles 1″-2″ long; bracts small, early caducous. Sepals equal, rounded, obtuse, ·2″ long, thin, glabrous. Corolla tubular-campanulate; limb about ·75″ across, margins white, light-purple in the centre. Filaments hairy at the base. Capsule ovoid, about ·3″ long, glabrous; seeds 4, with silky-hairy; hairs ·25″ long.

Fig 431. Ipomæa campanulata, Linn.

Assam, Penang, Ceylon, South Deccan peninsula, common in Mysore along the base of the Bababudan hills near nallahs and water-courses, rather rare in the Bombay presidency in hedges and near nallahs in the southern parts of the Dharwar district. Fl. Dec.-Mch. Fr. Mch.-Apl. A handsome flowering species.

5. I. campanulata, Linn.; Choisy, Convolv. Or. 69; Dalz. & Gibs. Bomb. Fl. 165; Fl. Br. I. 4, 211; Cooke Fl. Pres. Bomb. 2, 247; Graham Cat. Bomb. Pl. 131; Trimen Fl. Ceyl. 3, 221. *Tugelmi, goili,* M. *Kugini-bally,* K.

A large and extensively climbing shrub; branches

angular, rough, glabrous; branchlets and shoots white-tomentose. Leaves broadly ovate, 3″-6″by 2″-5″, acute or shortly acuminate at the apex, more or less cordate at the base, thinly coriaceous, glabrous above, glabrous or pubescent beneath; lateral-nerves 10-17 pairs, prominent beneath; petioles 1″-3″ long, stout, glabrous or pubescent. Flowers large, in peduncled, many-flowered, bracteate, corymbose cymes; peduncles stout, glabrous, 2″-5″ long; pedicels ·5″-1″ long, thickened in fruit; bracts small, early caducous. Sepals orbicular-ovate, nearly equal, about ·5″ in diameter, obtuse, thick and succulent, more or less white-pubescent. Corolla tubular-campanulate, 3″ long, white with a purple centre; limb distinctly lobed, about 3″ across. Capsule globose, ·5″ in diameter, brown, glabrous, enclosed in the enlarged calyx; seeds ovoid, flattened, dark velvetty, covered with a basal beard of long, silky, light-brown hairs.

Western peninsula, Ceylon and the Malay peninsula, common in the Konkan and N. Kanara ghât monsoon-forest usually on the borders of forests or near villages or deserted cultivation. Ascends to 3700′ in the Khandesh Akrani and to 4500′ near Mahableshwar. Fl. C. S. Dec-Jan. Fr. ripe May.

A large and very handsome showy climber when in bloom during the cold season. The young shoots are made into curries and the long slender stems employed as cordage.

6. I. cymosa, Rœm. & Sch. Syst. 4, 241; Fl. Br. I. 4, 211; *Convolvulus blandus,* Roxb. Fl. Ind. 1, 470; *Merremia umbellata,* Hallier f. in Engl. Bat. Jaharb. 16, 552 and 18, 114; Cooke Fl. Pres. Bomb. 2, 237.

A twining perennial with long slender slightly pubescent stems. Leaves ovate-oblong or hastate, 1·5″-2·25″ by ·5″-1″, shortly acuminate, obtuse or acute at the apex, slightly cordate at the base, coriaceous, slightly pubescent on both sides; lateral-nerves about 6 pairs, distinct beneath; petioles ·25″-1″ long. Flowers middle-sized, 1″-1·5″ long in few or many-flowered, pedunculate, bracteate, subumbellate cymes; peduncles usually recurved, ·25″-1·5″ long; pedicels nearly as long as the peduncles; bracts early caducous. Sepals broadly ovate, ·25″ long, glabrous; outer long-apiculate. Corolla white, tubular funnel-shaped, 1″-1·5″ long; limb distinctly lobed with faintly lineate bands; buds pubescent at the top. Stamens included. Capsule globose, ·5″ in diameter, glabrous; seeds ovoid with long blacker and stiffer, spreading hairs than in the allied species.

Throughout tropical India, Ceylon, Java and the Malay archipelago, China, Australia, W. Indian islands, Tropical Africa; common in the Konkan and N. Kanara monsoon-forests. Fl. Feb.-Mch. A handsome flowering species.

7. I. Turpethum, Br. Prodr. Fl. Nov. Holl. 485; Fl. Br. I. 4, 212; Trimen Fl. Ceyl. 3, 222; Dalz. & Gibs. Bomb. Fl. 165; Grah. Cat. Bomb. Pl. 131; *Operculina Turpethum,* Silva Manso, Enum. Subst. Braz. 16 and 49; Cooke Fl. Pres. Bomb. 2, 240; *Nishottar, dudh-kalmi, ter, shetar, phutkari,* M.

A twining perennial with milky juice; stems long, twisted, angular or winged, glabrate or pubescent; roots long, slender, fleshy. Leaves variable in size and shape, ovate to ovate-lanceolate and sagittate, 2″-4″ by ·5″-3″, obtuse, acute or acuminate at the apex, cordate or rounded at the base; margins often sinuate, more or less pubescent, particularly when young; lateral-nerves about 10 pairs, prominent beneath with distinct, reticulate venation between; petioles 1″-5″ long. Flowers large, white, in few-flowered, stout-peduncled, bracteate cymes; peduncles 1″-4″ long; pedicels ·25″-1·5″ long, stout, thickened upwards; bracts reddish, oblong-lanceolate, about 1″ long, very early caducous. Sepals unequal, ovate or suborbicular, glabrous, membranous, long-apiculate, 2 outer nearly 1″ in diameter, the inner 3 smaller. Corolla subcampanulate, about 2″ long; tube with 5 vertical, smooth bands; limb 1·5″ across. Stamens 5; filaments filiform; anthers at length twisted; pollen smooth. Ovary 2-celled, glabrous; ovules 4; style filiform; stigma 2-globose. Capsule globose, ·5″ in diameter, completely enclosed in the membranous sepals, 4-lobed, valveless, circumcissile about the middle; seeds normally 4, often solitary, black, glabrous.

Throughout the tropics of both continents, sometimes cultivated; common in the dry Deccan districts also in the Konkan and N. Kanara. Fl. Oct.-Nov. Fr. Dec.-Jan. The roots known in medicine as *Indian Jalap* or *Turpeth-root* are a strong purgative.

8. I. vitifolia, Sweet, Hort. Brit. Ed. 2, 372; Fl. Br. I. 4, 213; Dalz. & Gibs. Bomb. Fl. 165; Trimen Fl. Ceyl. 3, 224; *Merremia vitifolia*, Hallier, f. in Engl. Bot. Jahrb. 16, 552; Cooke Fl. Pres. Bomb. 2, 239. *Navalicha-vel.* M.

A perennial twiner or prostrate shrub with stout much-branched stems covered with deciduous, spreading whitish hair. Leaves deeply 5-7-palmately lobed, 2·5″-6″ in diameter, cordate at the base; lobes triangular-acuminate with irregularly serrate margins, sparsely hairy on both sides, distinctly palmately 5-7-nerved; petioles ·5″-2″ long, patently white-hairy. Flowers yellow, campanulate, 1″-2″ long in few-(1-7-) flowered, peduncled, bracteate cymes; peduncles 1″-4″ long; bracts linear, accrescent in fruit, caducous. Sepals ovate, about ·5″ long, acute, apiculate, patently white-hairy; outer shorter. Corolla about 1·5″ long with strongly lineate bands. Capsule depressed-globose, membranous, about ·5″ in diameter; seeds 1-4, glabrous.

Throughout tropical India, except the dry North-West, Sikkim, Assam and Burmah southwards to Ceylon and Malacca, Malay Archipelago; monsoon and rain-forests of the Konkan and N. Kanara, common on the Supa ghâts, often creeping near roadsides. Fl. C. S. Jan.-Feb.

9. I. biloba, Forsk, Fl. Ægypt.-Arab. 44; Fl. Br. I. 4, 212; Cooke Fl. Pres. Bomb. 2, 248; Trimen Fl. Ceyl. 3, 224; *I. Pes-Capræ,* Sweet; Graham Cat.

Bomb. Pl. 130; Dalz. & Gibs. Bomb. Fl. 164. *Maryad-vel, marjad-vel, sumudra-phen*, M.

A large creeping perennial; stems many, long, prostrate, rarely twining, glabrous. Leaves deeply bilobed, 1·2″-2″ by 2″-3″, cuneate or truncate at the base; lobes obliquely ovate, coriaceous, shining glabrous, strongly parallel-veined; midrib ending in a mucro between the lobes; petioles 2″-4″ long, erect, glandular at the apex. Flowers large usually solitary, peduncled, bracteate; peduncles from 1″-4″ long, erect; pedicels about 1·5″ long, stout; bracts lanceolate, early caducous. Sepals broadly ovate, ·5″ long, subacute. Corolla purple, widely funnel-shaped, 1·5″-2″ long; lobes shallow, acute, apiculate. Filaments dilated and hairy at the base. Capsule ovoid, about ·5″ long, glabrous; seeds dark-brown villous.

Throughout India and Ceylon on the sandy sea-coasts above high water; tropical shores generally. Fl. Oct.-Dec. An ornamental flowering species. The leaves are employed medicinally as an external application for rheumatism.

10. I. palmata, Forsk. Fl. Ægypt-Arab. 43; Fl. Br. I. 4, 214; Cooke Fl. Pres. Bomb. 2, 250; Trimen Fl. Ceyl. 3, 225.

A slender, glabrous, perennial twiner; stems often rough lenticellate. Leaves compound, 1″-2″ long and as broad; leaflets 3-7, usually 5, sessile, oblanceolate, obtuse, mucronate, glabrous with ciliate margins; terminal leaflet largest; petioles ·5″-2″ long. Flowers large, 2-3 or usually solitary on thick bracteate, downwards curved peduncles about ·5″ long; pedicels ·25″-·5″ long, thickened in fruit; bracts minute. Sepals ovate, ·25″ long, obtuse, glabrous, white speckled within. Corolla widely funnel-shaped, 1·5″-2″ long, violet with a purple tube. Capsule globose, about ·5″ in diameter; seeds pubescent with a marginal fringe of silky white hairs.

Deccan peninsula and Ceylon, throughout tropical India in moist regions, often cultivated; common near the sea-coast of N. Kanara. Fl. Feb.-June and generally throughout the year. Sometimes cultivated in gardens for its beautiful flowers.

6. PORANA, Burm.

Climbing or twining shrubs or herbs. Leaves usually entire. Flowers purple, steel-blue or white, often small, usually in large, terminal, bracteate panicles; bracts persistent. Sepals much enlarged and wing-like in fruit. Corolla campanulate or funnel-shaped, wide or narrow at the mouth; limb 5-plaited, subentire or lobed. Stamens 5, subincluded. Ovary 2-celled, 4-ovuled; style long or short, entire or 2-fid; stigma 2-lobed or 2-capitate. Capsule membranous, usually 1-seeded by abortion.

1. P. malabarica, C. B. Clarke, in Fl. Br. I. 4, 223; Cooke Fl. Pres. Bomb. 2, 226; *P. racemosa,* Grah. Cat. Bomb. Pl. 133 (not of Roxb.); Dalz. & Gibs. Bomb. Fl. 162. *Bhowri, gariya,* M.

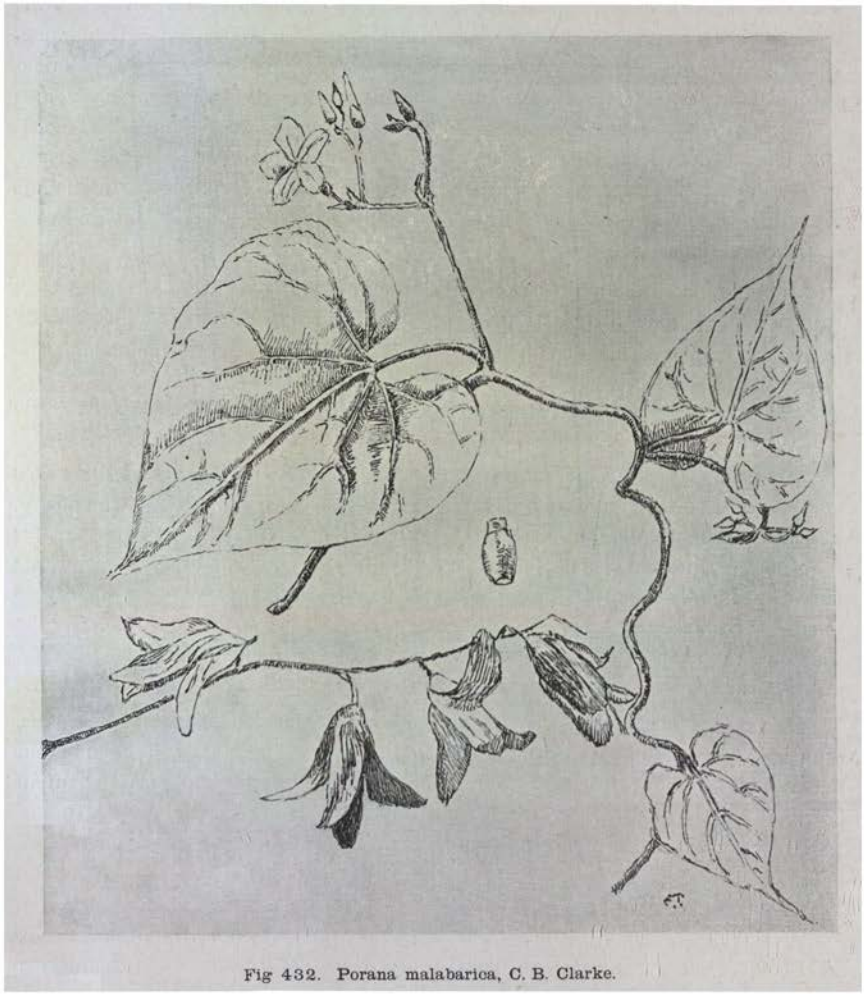

Fig 432. Porana malabarica, C. B. Clarke.

A large, twining, spreading shrub; stems slender, glabrous. Leaves broadly ovate, 2″-5″ by 1·5″-4·5″, shortly acuminate at the apex, deeply cordate at the base, membranous, sparsely hairy above and on the nerves beneath; nerves slender, looping within the margin; petioles 1″-3″ long, slender, glabrous. Flowers

white in large, lax, axillary, bracteate racemes or panicles; pedicels slender, about ·25″ long; bracts leafy, cordate, persistent, smaller upwards. Sepals narrowly ovate-oblong, ·2″ long, pubescent, enlarged in fruit. Corolla divided to near the middle, about ·5″ long; lobes ovate, acute. Capsule obovoid, ·25″ long, pointed; fruiting-sepals narrowly elliptic about 1″ by ·25″, scarious, strongly nerved and reticulately veined, often pinkish in colour.

Common about Mahableshwar and along the higher Deccan ghàts, absent from the southern parts of the presidency, apparently endemic. Fl. Oct.-Nov.

2. *P. paniculata*, Roxb. Cor. Pl. 3, 31, t. 235 is cultivated in gardens about Poona for its handsome great panicles of small white flowers which are much used for table decoration.

7. BREWERIA, R. Br.

Erect or twining shrubs or herbs. Flowers terminal or axillary in heads or panicles; bracts small. Sepals equal or unequal, scarcely altered in fruit. Corolla campanulate or funnel-shaped; limb plaited. Stamens included, dilated at the base. Ovary 2-celled, 4-ovuled; styles 2, nearly distinct; stigmas capitate. Capsule globose or ovoid, normally 4-seeded. Seeds glabrous or pilose.

A large twining shrub. Flowers large ... ... 1. B. cordata.

A low, erect rigid shrub. Flowers very small ... 2. B. latifolia.

1. B. cordata, Blume, Bijdr. 722; Fl. Br. I. 4, 223; Cooke Fl. Pres. Bomb. 2, 230; *B. Roxburghii,* Choisy in Mem. Phys. Soc. Genev. 6, 493; Dalz. & Gibs. Bomb. Fl. 162.

A large and lofty twining shrub; stems stout, pubescent or tomentose. Leaves ovate, 2″-3″ by 1·5″-2″, acuminate at the apex, broadly cordate at the base, pubescent above, densely fulvous-hairy beneath; lateral-nerves 7-9 pairs, prominent beneath; petioles ·5″-1·5″ long. Flowers pure white on 2-10 usually 6-flowered, stout-peduncled, capitate cymes; peduncles 1″-4″ long; pedicels about ·25″ long. Sepals ovate-oblong, ·5″ long, villous, the two outer somewhat longer than the 3 inner. Corolla wide funnel-shaped, about 1″ long, hairy on the outside, plaited in bud. Styles 2, free or slightly connate; stigmas capitate. Capsule globose, about ·5″ in diameter, glabrous, enclosed in the slightly accrescent calyx; seeds glabrous, black.

Western peninsula from the Konkan southwards, Eastern Bengal and the Malay peninsula, Ceylon; throughout the Konkan and N. Kanara, rather rare, usually along creeks near the sea-coast. Fl. Oct.-Dec. Fr. Jan.

2. B. latifolia, Benth. in Gen. Plant. 2, 877; Fl. Br. I. 4, 224; Cooke Fl. Pres. Bomb. 2, 230.

An erect, much-branched, low shrub, with shining silvery stems and branches. Leaves elliptic-oblong, small, about ·5″ long, obtuse at the apex, acute at the base, densely silky; petioles very short. Flowers 1-3, sessile in the upper axils; bracteoles 2, linear-acute, inserted beneath the calyx. Sepals ovate, about ·2 long, silky outside, veined within. Corolla scarcely exceeding the calyx; limb 5-lobed with 5 hairy bands between the folds. Capsule ovoid-acute, hairy at the top, ·2″ long, splitting into 4 valves to the base.

Tropical Africa and the Punjab, Sind and Kathiawar in the Bombay presidency. A small desert species. Fl. Dec.

8. NEUROPELTIS, WALL.

A lofty climber; stems rough, tubercled; branchlets red-tomentose. Leaves alternate. Flowers small, bracteate in short, villous racemes; bract inconspicu-

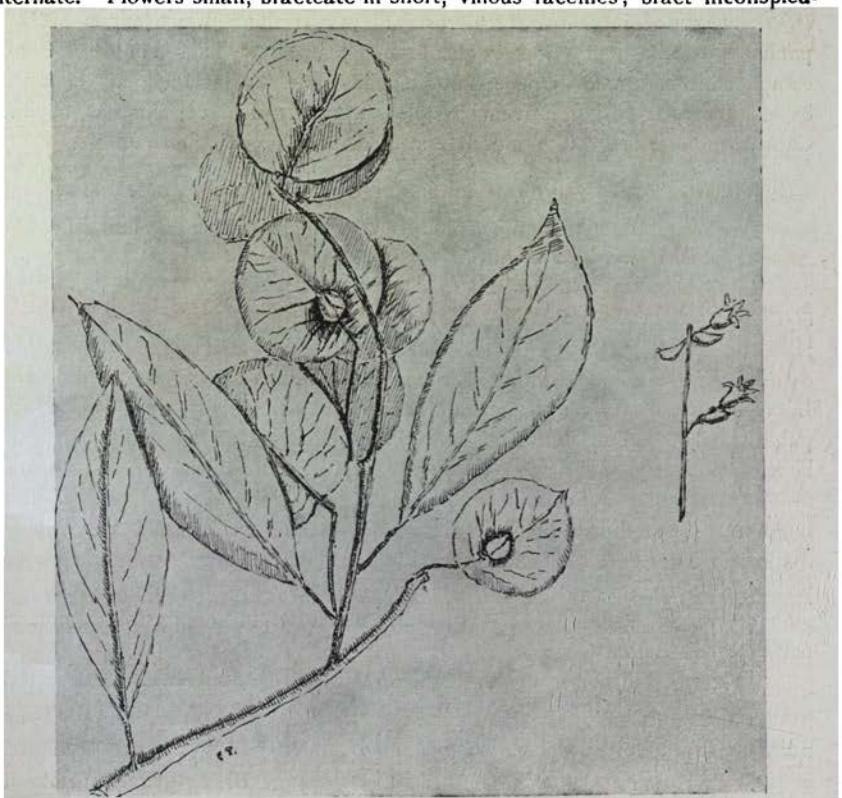

Fig 433. Neuropeltis racemosa, Wall.

ous in the flower-bud. Sepals suborbicular, hardly changed in fruit. Corolla small, funnel-shaped; lobes entire. Stamens 5; filaments villous. Ovary 2-celled, 4-ovuled; styles 2, separate from the base. Fruit a small, globose, 1-seeded capsule, sessile in the centre of a large scarious, veined, orbicular bract. Seed globose, glabrous, albuminous; cotyledons plaited.

N. racemosa, Wall. Cat. 1322; Fl. Br. I. 4, 255; Bedd. Ic. Ind. Or. t. 291; Cooke Fl. Pres. Bomb. 2, 227; Gamble Ind. Timb. 507.

A large climber with densely red-hairy branchlets. Leaves elliptic, 3″-5″ by 1·75″-2·25″, long or shortly finely acuminate at the apex, cuneate, sometimes unequal-sided at the base, coriaceous, glabrous above, more or less rufous-hairy beneath; lateral-nerves about 12 pairs, parallel and sharply defined beneath; petioles ·25″-·5″ long. Flowers small in lateral, few-flowered, rusty-villous, 1″-6″-long racemes; pedicels very short. Sepals rounded, ·1″ in diameter, rufous-hairy, ciliate. Corolla broadly campanulate, ·25″ long, red-villous outside. Capsule glabrous, ·25″ in diameter, nearly sessile below the centre of the large orbicular, emarginate bract; bract 1″-1·5″ in diameter, at length glabrous, scarious.

Malay peninsula from Mergui southwards, Burmah, Malabar plains; in rain-forest of the Supa subdivision of N. Kanara near Potolli, very rare. Fl. C. S. Fr. ripe May. The veined orbicular ripe fruiting bracts are very characteristic.

Order LXV.—SOLANACEÆ.

Herbs, shrubs sometimes scandent or small, soft-wooded trees. Leaves alternate, often in unequal pairs, never really opposite; stipules O. Flowers regular, pentamerous, bisexual, in terminal or lateral cymes or on solitary or clustered pedicels; bracts and bracteoles O. Calyx gamosepalous, 5-lobed, inferior. Corolla 5-lobed, campanulate or rotate; limb often plaited. Stamens 5, inserted on the corolla-tube and alternate with the lobes. Ovary free, 2-celled; ovules numerous; style linear; stigma capitate. Fruit a large or small berry, rarely capsular. Seeds numerous, discoid; albumen fleshy; embryo curved or spiral.

An order of great economic importance containing the potatoe, tobacco and other valuable herbaceous plants belonging to the genus Solanum, the small soft wooded trees and shrubs of this genus are however of comparatively small interest to the forester.

Corolla-lobes plaited in bud	1.	Solanum.
Corolla-lobes imbricate in bud	2.	Lycium.

1. SOLANUM, LINN.

Herbs shrubs or small trees, prickly or unarmed; hairs usually stellate. Leaves simple. Flowers in lateral or terminal, dichotomous or racemose cymes. Calyx 5-10-lobed, unaltered or enlarged in fruit. Corolla rotate; limb plaited in bud. Stamens 5; anthers opening by terminal pores or slits. Ovary 2-celled; style columnar; stigma small. Berry with numerous, discoid seeds; embryo peripheral with a fleshy albumen within.

An unarmed tree. Berry yellow	1.	S. verbascifolium.
A prickly tree. Berry red	2.	S. giganteum.

1. S. verbascifolium, Linn; Dunal in DC. Prodr. 13, pt. 1, 114; Fl. Br. I. 4, 230; Dalz. & Gibs. Bomb. Fl. 175; Cooke Fl. Pres. Bomb. 2, 263. *Kutri,* M.

A large shrub or small tree, whole plant densely brownish-yellow tomentose. Leaves entire, elliptic-lanceolate, 5″-9″ by 2″-6″, acuminate at the apex, acute at the base, tomentose above, white-woolly beneath; petioles ·75″-1·5″ thick, stout. Flowers white or pale-blue, nodding, in dichotomous, peduncled corymbs; peduncles stout, erect, 2″-4″ long. Calyx cupular, 5-lobed, very woolly; lobes short, triangular. Corolla ·5″ across, woolly outside, deeply lobed; lobes ovate. Fruit yellow, ·3″ in diameter, sparsely covered with stellate hairs, seated on the enlarged calyx; seeds ·1″ in diameter, minutely rugose.

Throughout tropical and sub-tropical India, Ceylon, ascends to 6000′ in the Nilgiris where it is often gregarious in favorable moist localities; common in the Bombay presidency; Supa monsoon-forests also on the Mahableshwar laterite. Fl. Oct.-Nov. Fr. Dec-Jan. Usually a large shrub. Bark grey, smooth, wood soft, light-yellow.

2. S. giganteum, Jacq. Coll. 4, 125; Fl. Br. I. 4, 233; Dalz. & Gibs. Bomb. Fl. 175; Cooke Fl. Pres. Bomb. 2, 266; *Kutri, chunna,* M.

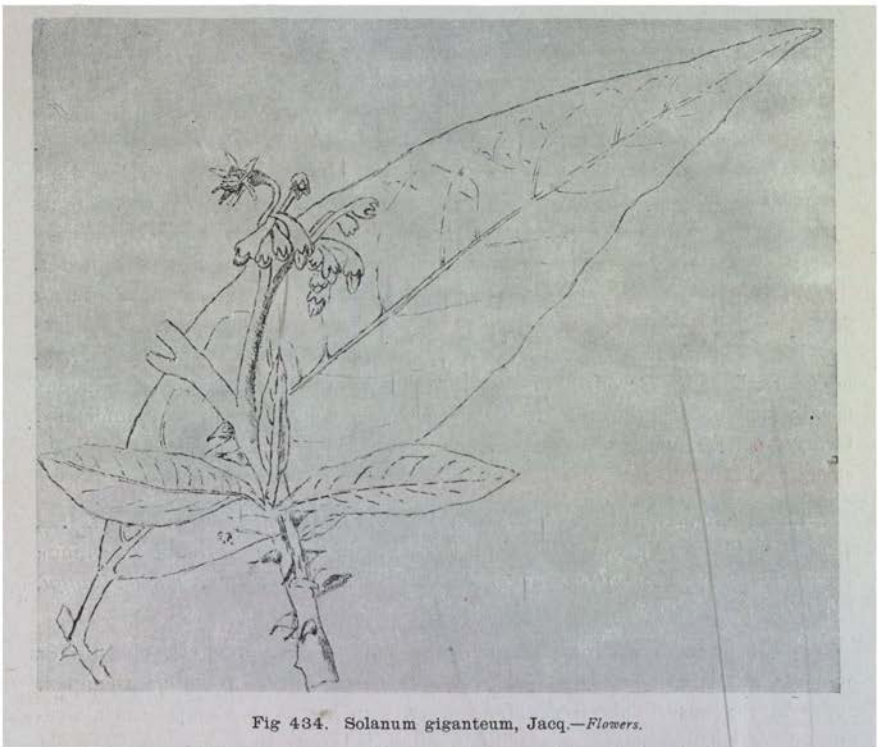

Fig 434. Solanum giganteum, Jacq.—*Flowers.*

A large, prickly shrub or small tree; branches densely stellately tomentose; prickles sparse, large, broadly triangular. Leaves entire, oblong-lanceolate, 6″-9″ by 1·5″-2″, acute and tapering at both ends often unequal-sided at the base, finely stellately white-tomentose beneath; lateral-nerves about 12 pairs, impressed above; petioles 1″-1·5″ long. Flowers rather small, in lateral, panicled, corymbose, pedunculate cymes; peduncles short, stout. Calyx densely flocculent-tomentose; lobes short, triangular. Corolla blue, ·5″ across; tube about ·1″ long; lobes lanceolate, acute. Berry ·3″ in diameter, seated on the slightly enlarged calyx, scarlet; seeds finely muriculate.

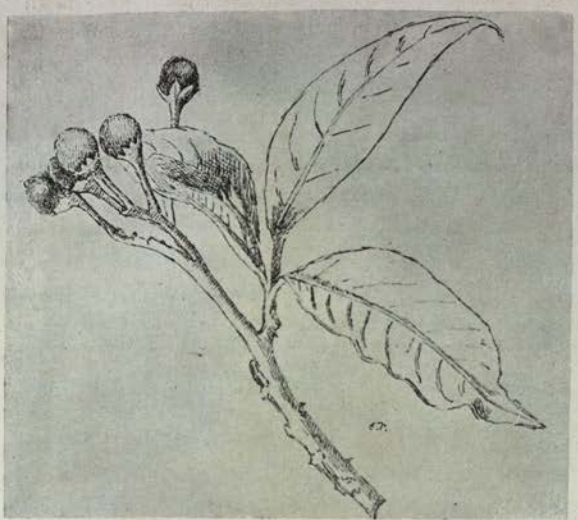

Fig 435. Solanum giganteum, Jacq.—*Fruit.*

Mountains of the S. Deccan and Ceylon, 3-7000′; throughout the Konkan and N. Kanara, usually in rain-forest or its vicinity. Fl. R. S. Fr. Oct.-Nov.

2. LYCIUM, Linn.

Shrubs with usually spinous branches. Leaves small often fascicled, entire. Flowers small; pedicels solitary or fascicled at the nodes. Calyx campanulate, at first 5-merous, afterwards irregularly 3-5-lobed or 2-lipped. Corolla funnel-shaped; lobes 5-4, imbricate in bud. Stamens usually unequal; anthers exserted or included; cells dehiscing longitudinally. Ovary 2-celled; ovules few or many; style filiform; stigma subcapitate. Berry small, ovoid, or globose. Seeds usually few, compressed, scrobiculate.

L. barbarum, Linn. Sp. Plant. 192; Boiss. Fl. Orient. 4, 289; Fl. Br. I. 4, 241; Brandis For. Fl. 345; Cooke Fl. Pres. Bomb. 2, 272; *L. europæum,* Linn.; Fl. Br. I. 4, 240; *L. mediterraneum,* Dunal; Prodr. 13, 1, 523. *Ganger, kangu,* Pb. *Chiritta,* Delhi.

A small spinous shrub; branches grey, glabrous. Leaves obovate or oblong-spathulate, ·5″-1·5″ by ·2″-·5″, often fascicled, obtuse or acute at the apex, acute at the base, glabrous; petioles very slender, ·25″-·5″ long. Calyx irregularly 3-5-lobed or sometimes 2-lipped, about ·1″ long; lobes minute. Corolla ·5″ long, glabrous; lobes ·1″ long, oblong, obtuse. Stamens exserted or subincluded; filaments glabrous. Ovary ovoid, glabrous. Berry bright-red or yellow, ·25″ in diameter; seeds enclosed in viscid pulp, discoid, orange-yellow, minutely pitted. Punjab, Beluchistan, Afghanistan, plains of Sind, and Guzerat. Fl. Oct.-Mch. The fruit is edible and the branches and shoots serve as fodder for camels and goats.

I have considered *L. barbarum,* and *L. europæum,* as the same species which is evidently the opinion of C. B. Clarke and other recent authors.

Order LXVI.—GESNERIACEÆ.

Herbs or rarely undershrubs. Leaves alternate, opposite or whorled, exstipulate. Flowers hermaphrodite, axillary or terminal, irregular, bracteate. Calyx free, 5-divided or sepals 5, valvate. Corolla gamopetalous, tubular or campanulate; tube long or short; segments 5, imbricate in bud. Perfect stamens 4 on the corolla-tube, didynamous, often only 2 fertile. Disk various. Ovary superior, 1-celled or sub 2-celled; ovules many; style linear; stigma capitate or 2-lobed; placentas parietal, bifid. Fruit a capsule or berry, rarely indehiscent or circumcissile. Seeds many, minute, reticulate; albumen O or scanty.

ÆSCHYNANTHUS, JACK.

Epiphytic undershrubs. Leaves opposite, fleshy. Calyx truncate, 5-fid or sepals 5. Corolla tubular-ventricose; limb 2-lipped. Stamens 4, didynamous; anthers connate in pairs. Disk annular. Ovary superior, stipitate; plancentas deeply inflexed, bearing the ovules; stigma peltate. Capsule long, linear, loculicidally 2-valved. Seeds many, small, sessile, pendulous, rugose, hairy at the end next the hilum, one hair-like process at the apex.

Æ. Perottetii, A. DC. Prodr. 9, 261; Fl. Br. I. 4, 339; Dalz. & Gibs. Bomb. Fl. 135; Cooke Fl. Pres. Bomb. 321; *Æ. grandiflorus,* Grah. Cat. Bomb. Pl. 146.

An epiphytic undershrub. Branches grey, smooth, compressed, shining, often swollen at the nodes. Leaves lanceolate, 1·5″-3·5″ by ·6″-·75″, bluntly acuminate at the apex, acute or obtuse at the base, thick, glabrous; lateral-nerves 3 pairs, very oblique; venation reticulate, inconspicuous; petioles ·1″-·25″ long, stout. Flowers red, about 2″ long, solitary in the axils of the terminal pair of leaflets or in 3-6-flowered, axillary umbels; pedicels ·25″ long. Calyx about ·25″ long, divided into 5 nearly distinct sepals. Corolla 1·5″-1·75″ long, early deciduous; tube curved, enlarged at the oblique mouth; lobes obtuse, reflexed, marked with purple lines and ciliate on the margins. Stamens long-exserted; filaments minutely glandular-pubescent. Capsules linear, shining, glabrous, 3″-8″ long, loculicidally 2-valved; seeds numerous.

Western peninsula from Bombay southwards, Nilgiris; common in rain-forest along the southern ghâts of N. Kanara also in the Konkan. Fl. Oct.-Jan. Fr. ripe next cold season.

An epiphyte with handsome flowers scarcely worth including in this work. *Æ. ceylanica,* Gardn. the common Ceylon species scarcely differs from the above; it has somewhat smaller flowers.

Order LXVII.—BIGNONIACEÆ.

Trees shrubs or woody climbers, rarely herbs. Leaves 1-3-pinnate or rarely simple, exstipulate. Flowers bisexual, irregular, usually zygomorphic, showy, racemose or panicled. Calyx free, campanulate, 2-5-lobed or spathaceous. Corolla tubular-ventricose, 2-lipped at the mouth; lobes 5, imbricate in bud. Stamens 4, didynamous or 5; anthers included or shortly exserted; cells 2, parallel or divaricate, dehiscing by longitudinal slits. Disk cushion-like or annular. Ovary 2-celled; ovules numerous in many rows, anatropous; style long, glabrous; stigma of 2, elliptic lobes. Fruit usually an elongate capsule with the dissepiment enlarged and separating from the valves. Seeds compressed, discoid, usually broadly winged, exalbuminous.

An order of trees and woody climbers chiefly remarkable for the size and beauty of their flowers. The economic uses of the species are comparatively unimportant.

Perfect stamens 5 ... ... 1. Oroxylum.

Perfect stamens 4, didynamous.

Leaves simple ... ... 2. Tecomella.

Leaves 1-2-pinnate.

Capsule linear, not-winged.

Calyx spathaceous ... ... 3. Dolichondrone.

Calyx irregularly 3-5-cleft.

Dissepiment of capsule flat or angular ... 4. Heterophragma.

Dissepiment of capsule cylindrical, corky 5. Stereospermum.

Capsule oblong, longitudinally 4-winged ... 6. Pajanelia.

1. OROXYLUM, VENT.

A glabrous small tree. Leaves bi-tri-pinnate, large; leaflets entire. Flowers large, in erect, terminal racemes. Calyx persistent, leathery, large, campanulate, truncate. Corolla campanulate, oblique, 5-lobed, large, white or purplish; lobes subequal, crisped and toothed. Stamens 5, all fertile; anthers 2-celled; cells divergent below. Ovary subsessile, constricted below; stigma with 2, broad, flat lobes. Capsule large, broadly linear, flat with the dissepiment parallel to the valves, septicidally dehiscent. Seeds with a broad hyaline wing.

O. indicum, Vent. Dec. Gen. Nov. 8; Fl. Br. I. 4, 378; Bedd. Fl. Syl. 148; Cooke Fl. Pres. Bomb. 2, 327; Gamble Ind. Timb. 510; *Bignonia indica,* Linn.

Sp. Pl. 625; Grah. Cat. Bomb. Pl. 125; *Calosanthes indica,* Blume Bijdr. 761; Dalz. & Gibs. 161. *Tetu.* M.

A small, deciduous, glabrous tree. Leaves very large with a stout rachis; 2-3-pinnate, 4′-6′ long; leaflets ovate or elliptic, 2·5″-5″ by 1·5″-4″ long, abruptly acuminate at the apex, rounded or subcordate at the base; petiolules short. Flowers large, purple, fœtid, in erect, terminal, pedunculate, more or less unilateral racemes 1′-2′ long; peduncles hollow; pedicels ·25″-1″ long. Calyx oblong-campanulate, 1″ long, fleshy, glabrous. Corolla 2″-3″ long and nearly as broad at the mouth; lobes about 1·5″ long with crisped margins. Disk large, fleshy. Stamens shortly exserted; filaments cottony at the base. Capsule 1′-2·5′ long, and 2″-3″ broad; valves hard, dark-coloured, tapering at both ends; seeds 2″-2·5″ across, winged all round except at the base.

Throughout tropical India in moist forests, absent from the dry Deccan area; sparsely distributed along the Konkan and N. Kanara ghâts, very common in rain-forest near Nilkund. Fl. May-July. Fr. ripe Jan. remains long on the tree. A small tree 30′-40′ high and 1′-1·5′ in diameter. Bark light-brown, soft, containing much greenish juice. Wood yellowish-white, soft; no heartwood. Pores moderate-sized, uniformly distributed. Annual-rings distinct. Medullary rays fine to moderately broad, prominent on a radial section. Weighs about 30 lbs. to the cub. ft. The bark is used for tanning and dyeing and according to Trimen as an astringent tonic in Ceylon. "The seeds are employed to line hats and in the construction of umbrellas in Sikkim" Gamble.

2. TECOMELLA.

A shrub or small tree. Leaves simple, usually opposite. Flowers in terminal racemes or panicles. Calyx campanulate, subequally 5-toothed. Corolla tubular-ventricose, 5-lobed; lobes subequal. Stamens glabrous, inserted in the lower part of the corolla-tube; anthers 2-celled; cells divergent and pendulous. Ovary 2-celled, on the cupular disk; ovules many in each cell. Capsule linear, more or less compressed at right angles to the septum, loculicidally dehiscent. Seeds flat, imbricate with a thin membranous wing; wing absent at the base and narrow at the top of the seed.

T. undulata, Seem. in Ann. & Mag. Nat. Hist. ser. 3, 10, 30; Cooke Fl. Pres. Bomb. 2, 328; *Tecoma undulata,* G. Don. Gen. Syst. 4, 223; Fl. Br. I. 4, 378; Dalz. & Gibs. Bomb. Fl. 161; Brandis For. Fl. 352; Talb. Trees Bomb. 256; Gamble Ind. Trees 511. *Lohuri, lohero,* Sind. *Rakta-rohida,* M.

A nearly evergreen shrub or small tree; young parts stellately grey-pubescent. Leaves simple, oblong or linear-oblong, 2″-5″ by ·5″-1·25″ obtuse, subcoriaceous, grey; margins more or less undulate; petioles ·75″ long. Flowers

large, orange, in corymbose, few-flowered racemes at the ends of short lateral branchlets. Calyx nearly ·5″ long, campanulate ; lobes ovate-obtuse, mucronate. Corolla campanulate, about 2″ long, veined, orange-yellow. Stamens exserted, glabrous. Ovary seated in the cup-shaped disk; stigma 2-lamellate. Capsule linear-oblong, curved, 6″-7″ long.

I have followed Seeman and other authors in separating *Tecomella* from *Tecoma*. The remarkable cup-shaped disk and simple leaves of the former are, I think, specific characters.

Western peninsula up to 3000′, Sind, Punjab, Rajputana extending eastwards to the Jumna, Guzerat and Khandesh; planted in gardens about Calcutta and Bombay. Fl. Mch.-April. Fr. May-July. A beautiful sight when in full bloom. Stems 30′-40′ high and 5′-8′ in girth. Bark reddish-brown or dark-grey, corky. Wood grey or yellowish-brown, close-grained, mottled, tough, strong and durable. Pores small and moderate-sized, enclosed in small rounded patches of whitish tissue which are often arranged in concentric lines. Medullary rays fine and moderately broad, prominent on a radial section as a silver grain. Weighs 44 lbs. to the cub. ft. "The wood is much prized for furniture, carving-work and agricultural implements." Brandis.

3. DOLICHONDRONE, Seem.

Glabrous or tomentose trees. Leaves opposite, 1-pinnate. Flowers in terminal racemes or panicles. Calyx spathaceous, split down one side to the base, caducous. Corolla long-tubular, 5-lobed; lobes imbricate in bud, crisped, crenate or incised on the margins. Stamens 4, didynamous, with a rudimentary fifth; anther-cells divergent. Disk annular, cushion-like. Ovary 2-celled; ovules numerous; stigma clavate. Capsule elongate, terete, cylindrical or compressed, loculicidally dehiscent; dissepiment free. Seeds discoid, prolonged at each end in a blunt corky wing.

Leaflets acuminate, glabrous; petiolules ·5″ long. Capsule slightly compressed ... ... 1. D. crispa.

Leaflets obtuse, pubescent; petiolules 0 or very short. Capsule much compressed, falcate .... 2. D. falcata.

1. D. crispa, Seem. in Jour. Bot. 8, 381 ; Fl. Br. I. 4, 379; Cooke Fl. Pres. Bomb. 2, 329; Gamble Ind. Timb. 512; *Spathodea crispa,* Wall. Cat. 6515; Brandis For. Fl. 350; Bedd. Fl. Sylv. 168; Dalz. & Gibs. Bomb. Fl. 160. *Mushwal, godmurki,* K.

A small or middle-sized deciduous tree; young shoots pubescent; branchlets thick, white, corky, swollen at the nodes. Leaves unequally-pinnate; leaflets 2-3 pairs with an odd terminal one, ovate or elliptic, 1″-3″ by ·5″-1·25″, shortly

acuminate at the apex, acute or rounded sometimes unequal-sided at the base, thinly coriaceous; lateral-nerves about 6 pairs, looping within the margin, prominent beneath; petiolules of the lateral leaflets ·25″-·5″ long, of the terminal leaflets much longer. Flowers pure white, fragrant, in terminal, 1-8-flowered racemes; pedicels ·5-1·5″ long. Calyx about 1″ long, curved and speckled. Corolla-tube 2·5″ long, slender, dilated upwards; limb 2″ across; lobes rounded with crisped or curled margins. Capsule 8″-18″ long by ·6″ in diameter, subcylindrical, curved and tapering at the apex; valves subwoody, rough, speckled, shining; seeds 1·25″ by ·25″, flattened rectangular, winged at the ends.

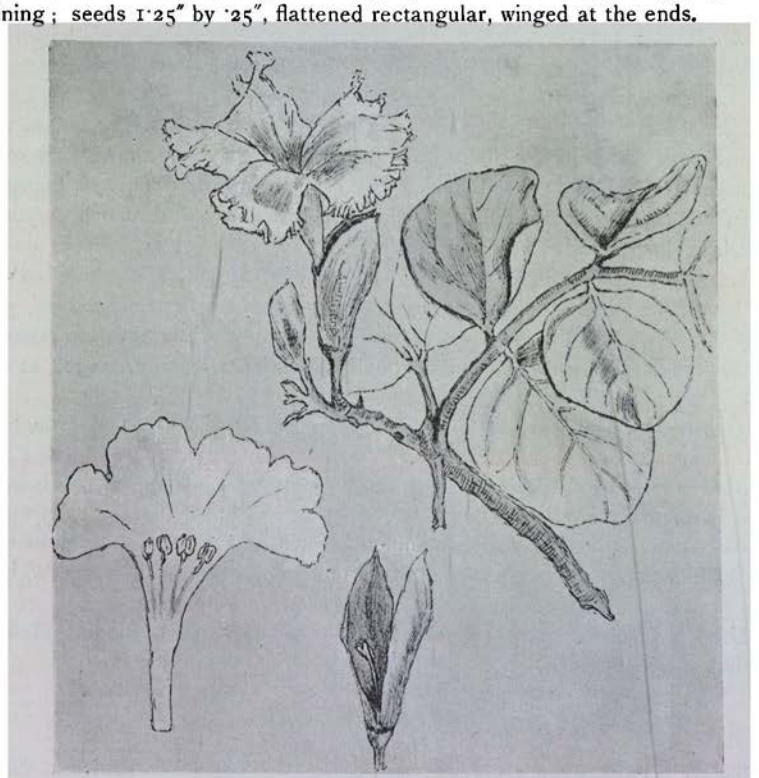

Fig 436. Dolichondrone crispa, Seem.

South Deccan peninsula, Carnatic; common in the dry deciduous thorn-forests of the Kuput-gudda range in the Dharwar district also at Sutguttee in the Belgaum district growing on sandstone. Fl. April-Sept. Fr. ripe after rainy season.

Usually a small tree. Bark rough, brown, about ·5″ thick. "Wood light yellowish-brown, moderately hard and even-grained. Pores moderate-sized, often

subdivided, scanty, surrounded by light-coloured rings and arranged in concentric lines where they are joined by the fine lines of loose tissue. Medullary rays fine, numerous, wavy. Wood of good quality, useful for building and in fair demand." Gamble.

2. D. falcata, Seem. in Seem. Jour. Bot. 8, 381; Fl. Br. I. 4, 380; Cooke Fl. Pres. Bomb. 2, 329; Gamble Ind. Timb. 512; *D. Lawii*, Seem. in Jour. Bot. 8, 380; *Spathodea falcata*, Wall. Cat. 6517; Dalz. & Gibs. Bomb. Fl. 160; Bedd. Fl. Sylv. t. 71; *Mersingi*, *medasingi*, M. *Godmurki*, K.

A small or middle-sized tree; branchlets pubescent; shoots pubescent or mealy-tomentose. Leaves unequally-pinnate; leaflets 2-3 pairs with a terminal one, suborbicular or broadly-ovate, ·75″-2″ by ·75″-1·8″; terminal leaflet larger than the lateral, obtuse, sometimes shortly pointed at the apex, rounded and unequal-sided at the base, coriaceous, pubescent or glabrous above, pubescent beneath; lateral-nerves 6 pairs, looping within the margins, prominent beneath; petiolules 0-·2′ long. Flowers white, scented, in few-flowered, terminal corymbs; pedicels ·5″ long. Calyx cylindrical, oblique, about ·75″ long, pubescent, shortly mucronate. Corolla-tube slender, 1·5″ long, dilated upwards. Capsule 10″-18″ long by ·75″ broad, flattened, strongly falcate, often more or less twisted, gradually tapering at the apex; valves with sinuous margins, sinuously striate, smooth shining; seeds rectangular, flattened, about 1″ long by ·25″ broad, winged at the ends.

Deccan peninsula, Mysore, Central Provinces and Rajputana; throughout the Deccan, Konkan and N. Kanara sparsely distributed in monsoon-forest. Fl. Mch.-May. Fr. Jany. Usually a small, deciduous tree with thin, grey, scaly bark. Wood hard, grey, mottled, shining and smooth, seasons well; no heart-wood. Annual-rings indistinct. Pores small, much subdivided, arranged in discontinuous, wavy bands. Medullary rays very fine and numerous, rather indistinct. Weighs about 50 lbs. 10 the cub. ft.

Used for building purposes and agricultural implements in the Madras presidency.

4. HETEROPHRAGMA, DC.

Trees. Leaves large, 1-pinnate. Flowers in terminal, woolly panicles. Calyx irregularly 3-5-lobed or lipped, closed in bud. Corolla 5-lobed, tubular-ventricose, usually white, rose or yellow, tomentose or glabrous; lobes 5, rounded, subequal. Stamens 4, didynamous, included; anther-cells divergent. Disk cushion-shaped. Ovary sessile; ovules many on each placenta; style elongate; stigma 2-lobed. Capsule elongate, cylindric or compressed, falcate or twisted, loculicidally 2-valved, spuriously 4-celled; dissepiment flat or 4-angled. Seeds compressed, winged at each end.

H. Roxburghii, DC. Prodr. 9. 210; Fl. Br. I. 4, 381; Dalz. & Gibs. Bomb. Fl. 160; Bedd. Fl. Sylv. 169; Cooke Fl. Pres. Bomb. 2, 330; Gamble Ind. Timb. 513; *Spathodea Roxburghii,* Spreng.; Brandis For. Fl. 350. *Wurus, panlag,* M. *Adwi-nuggi,* K.

Fig 437. Heterophragma Roxburghii, DC.

A large tree; young parts woolly-tomentose. Leaves pinnate, 1′-2′ long, opposite or in whorls of 3, approximate near the ends of the branches; leaflets 3-4 pairs, ovate, 2″-5″ by 2″-2·5″, very shortly acuminate at the apex, cuneate and unequal-sided at the base, entire or serrulate, nearly glabrous when mature; lateral-nerves 4 pairs, prominent beneath; petiolules ·25″-1·5″ long. Flowers white, very fragrant, in large, erect, terminal, fulvous-tomentose, bracteate

panicles; bracts thick, linear, tomentose, several at the base of the panicle; bracteoles 3 or more beneath each flower, linear, thick, tomentose, very early caducous; pedicels short, stout. Calyx ·75″ long, campanulate, irregularly 1-3-cleft, brown-tomentose outside, densely silky-hairy within. Corolla about 2″ long; tube pubescent when young, ultimately glabrous; lobes about ·5″ long with crisped, pink margins, crumpled in bud; corolla opens in the morning and falls off in the evening. Filaments hairy at the base. Capsule straight, 8″-12″ long by 2″ broad and ·5″ thick, velvety when young, afterwards glabrous; dissepiment 4-winged; seeds 1·5″ by ·75″.

Western peninsula from Bombay southwards, Central India, Godaveri forests; throughout the presidency, scattered in monsoon-forest; very common and conspicuous when in flower on the Nasik and Poona ghâts. Fl. Feb.-April. Fr. R. S. A large often a small or medium-sized tree. Bark grey, scaly. Wood dull dark-grey, rough, moderately hard. Annual-rings more or less distinct. Pores moderate-sized, numerous, uniformly distributed or arranged in irregular groups or lines. Medullary rays fine, lighter in colour than the wood. Weighs about 40 lbs. to the cub. ft. The timber is not much used in the Bombay presidency.

5. STEREOSPERMUM, CHAM.

Trees. Leaves opposite, 1-2-pinnate. Flowers in large, terminal, lax panicles. Calyx campanulate, truncate or shortly and unequally 2-5-lobed or 5-toothed, open or closed in bud. Corolla 5-lobed, bell or funnel-shaped, white, yellow or purple; lobes more or less connate. Stamens 4, didynamous, with a rudimentary fifth; anthers glabrous, cells very divergent. Disk fleshy, annular. Ovary elongate, 2-celled; ovules many, 2-seriate, horizontal. Capsule elongate, linear or compressed, cylindrical or quadrangular, loculicidally 2-valved; dissepiment spongy, ultimately free, filling the whole capsule. Seeds compressed or subtrigonous, winged at both ends; nucleus thin, flat or ridged and fitting into deep pits in the dissepiment.

Leaves imparipinnate. Seeds thick, transversely grooved and ridged.
Corolla yellow, tinged with purple, thinly pubescent ... ... 1. S. chelonoides.
Corolla lilac or purple, viscidly hairy ... ... 2. S. suaveolens.
Leaves bipinnate. Seeds thin, flat, not ridged.
Corolla white, glabrescent ... ... 3. S. xylocarpum.

1. S. chelonoides, DC. Prodr. 9, 210; Fl. Br. I. 4, 382; Bedd. Fl. Syl. t. 72; Brandis For. Fl. 352; Cooke Fl. Pres. Bomb. 2, 331; Gamble Ind. Timb.

514; *Bignonia chelonoides*, Linn.; Grah. Cat. Bomb. Pl. 282; *Heterophragma chelonoides*, Dalz. & Gibs. Bomb. Fl. 160. *Padal, paral, kirsel, tuatuka, padoly, koosga*, M. *Mukarti*, K.

Fig 438. Stereospermum chelonoides, DC.

A large deciduous tree; young parts glabrous. Leaves 12″-18″ long; leaflets elliptic, 4″-6″ by 1·5″-2″ caudate-acuminate at the apex, cuneate and sometimes unequal-sided at the base, glabrous, shining; rachis swollen at the base and joints, about 10″ long; lateral-nerves 4-5 pairs, slender and distinct beneath; petiolules ·5″-1·5″ long. Flowers fragrant, in slender, branched, drooping, bracteate panicles;

bracts minute, early caducous; branches and pedicels slender, articulate, glabrous. Calyx campanulate, ·25″ long, 3-5-toothed, glabrous, purple. Corolla about ·75″ long, yellow tinged with red, thinly hairy within and without; lobes rounded, crisped. Filaments with tufts of woolly hair at the base. Capsule slender, curved, 12″-30″ long by ·25″ thick, subquadrangular, glabrous, covered with raised, white specks; valves coriaceous with a raised midrib; dissepiment subcylindric, deeply notched; seeds 1·25″ long, easily splitting through the centre along the transverse furrow, wedge-shaped, inserted in the deep notches of the dissepiment.

Moister India from the lower Himalaya, Terai, (2000′) and Assam to Ceylon, Eastern Bengal, Pegu, Burmah (up to 4000′ in the Shan states). Western peninsula; throughout the Konkan and N. Kanara in monsoon and rain-forest. Fl. Apl.-June. Fr. Aug.-Jan. Leaves deciduous Feb.-Mch.; fresh foliage in April. A tall straight-stemmed tree in rain-forest, attaining 60′ in height by 2′-3′ in diameter. Bark brown, corky. Wood yellowish-grey, elastic, hard, smooth and fairly durable, takes a good polish. Pores moderate-sized, enclosed in interrupted concentric, narrow-wavy bands of white tissue. Medullary rays fine, short, distinct and prominent on a radial section as wavy bands of darker colour than the rest of the wood. Weighs about 55 lbs. to the cub. ft. Used for canoes, house-building and furniture in Assam and for tea-boxes in Cachar. The leaves, roots and flowers are employed in native medicine. The bark is used as a substitute for *Parul* bark *(S. suaveolens,)* as a tonic medicine in Ceylon. Fairly common in the kans about Bunwasi in N. Kanara. The wood deserves the attention of forest officers.

2. S. suaveolens, DC. Prodr. 9, 210; Fl. Br. I. 4, 382; Bedd. Fl. Syl. 169; Brandis For. Fl. 351; Cooke Fl. Pres. Bomb. 2, 331; Gamble Ind. Timb. 515; *Bignonia suaveolens,* Roxb. Fl. Ind. 3, 104; Grah. Cat, Bomb. Pl. 125; *Heterophragma suaveolens,* Dalz. & Gibs. Bomb. Fl. 161. *Parul, kalgari, patala, pahad,* M. *Hooday, billa,* K.

A large deciduous tree; young parts viscidly hairy. Leaves imparipinnate, 1′-2′ long; leaflets broadly-ovate, 3″-6″ by 2″-3″, 3-4 pairs and an odd one, shortly acuminate at the apex, rounded and unequal-sided at the base, often serrulate, rough above, pubescent beneath; lateral-nerves 6-8 pairs; venation reticulate; petiolules of the lateral-leaflets about ·1″ long of the terminal much longer. Flowers very sweetly-scented, in large, lax, trichotomous, viscidly hairy panicles. Calyx campanulate, ·4″ long, viscidly hairy; lobes 3-5, short, obtuse. Corolla dull-purple, 1″-1·5″ long, pubescent outside; limb oblique, lower 3 lobes longer than the 2 upper; margins rounded, crisped, crenate. Filaments hairy at the base. Capsule straight, cylindric, 12″-24″ long, slightly ribbed, rough with raised dots; valves coriaceous; seeds 1·25″ long by ·25″ broad; nucleus transversely furrowed, sunk in the deep notches of the cylindrical, brown, spongy dissepiment.

Throughout India in monsoon-forest, Sub-Himalaya from Kashmir to Sikkim and southwards to Travancore, Burmah, and the Western peninsula; only planted in Ceylon; common in the deciduous forests of the Dharwar district and in the Mundgode subdivision of the N. Kanara. Fl. Apl.-May. Fr. Nov.-Dec. Bark thin, grey, scaly. Sapwood large, grey, hard; heart-wood small, yellowish-brown, beautifully mottled, very hard and easily seasoned, fairly durable. Pores filled with a white shining gummy substance, moderate-sized, enclosed in white patches of tissue arranged in concentric lines or belts. Medullary rays fine, prominent on a radial section. Weighs about 45 lbs. to the cub. ft. "Used for building purposes and is converted into excellent charcoal." Gamble.

3. S. xylocarpum, Wgt. Ic. t. 1335-6; Fl. Br. I. 4, 383; Bedd. Fl. Sylv. 351. t. 70; Dalz. & Gibs. Bomb. Fl. 159; Gamble Ind. Timb. 516; *Spathodea xylocarpa,* T. And.; Brandis For. Fl. 349, t. 43; *Radermachera xylocarpa,* K. Schum. in Engl. & Prantl. Pflanzenf. 4, 3. B 243; Cooke Fl. Pres. Bomb. 2, 333. *Kharsing, kadashing,* M. *Genasing,* K. *Bairsing,* Vern.

A middle-sized, deciduous tree; young parts pubescent. Leaves bipinnate, 1′-4 long, glabrous; pinnæ opposite, 4-6 pairs; rachis grooved; leaflets 2-4 pairs with an odd one, ovate, 2″-3″ by 1″-1·5″, shortly acuminate or acute at the apex, cuneate and unequal-sided at the base, entire, coriaceous, glabrous; lateral-nerves about 6 pairs, prominent beneath; petiolules of lateral-leaflets 0-·25″ long. Flowers white, tinged with yellow, sweetly-scented, in large, compound, erect, pubescent panicles; pedicels about ·5″ long, with small, thick bracts at the base, arranged in few-flowered umbels. Calyx campanulate, ·5″-·6″ long; lobes 3-5, irregularly short and broad. Corolla ventricose, glabrous, 1·5″-2″ long; limb oblique; lobes with crisped margins. Filaments hairy at the base. Disk cupular, fleshy. Capsule 12″-30″ long by 1″-1·5″ broad, slightly curved, glabrous, tubercled; dissepiment cylindric with the seeds in shallow grooves; seeds in 4 rows, thinly discoid, 1·25″ long by ·25″ broad.

Deccan peninsula, extending north as far as Khandesh and the Central Provinces; Wynaad and Travancore up to 4000′; throughout the presidency in monsoon-forest, sometimes planted along roadsides in the Poona district; common in the Dharwar district monsoon-forests. Fl. Apl.-May. Fr. next H. S. A fine tree with a characteristic long, woody, tubercled fruit. Bark grey. Wood; sapwood large grey; heartwood brown, hard, tough, elastic and close-grained. Pores moderate-sized, usually filled with a white or yellowish resinous substance; each pore or group of pores enclosed in light-coloured tissue and arranged in zig-zag concentric lines or bands. Medullary rays fine, uniform, distinct. Weighs 56 lbs. to the cub. ft. A handsomely grained wood used for cabinet work. In Travancore made into poles and shafts for carts. Deserves the better attention of forest officers.

6. PAJANELIA.

A small or medium-sized, deciduous trees. Leaves broad, large, 1-pinnate; leaflets numerous. Flowers large, in great thyrsoid, bracteate, terminal panicles. Calyx 5-lobed, campanulate, closed and rufous-pubescent in bud. Corolla large, ventricose; lobes 5, crisped, unequal. Stamens 4 with a rudimentary fifth. Disk white, annular. Ovary immersed in the disk, 2-celled. Capsule large, broadly linear, compressed, longitudinally 4-winged, loculicidally 2-valved. Seeds winged all round.

P. Rheedii, DC. Prodr. 9, 227; Fl. Br. I. 4, 384; Bedd. Fl. Sylv. 169; Gamble Ind. Timb. 517; *P. multijuga,* DC. Prodr. 9, 227; Cooke Fl. Pres. Bomb. 2, 333. *Aminge,* K. *Doundi,* M.

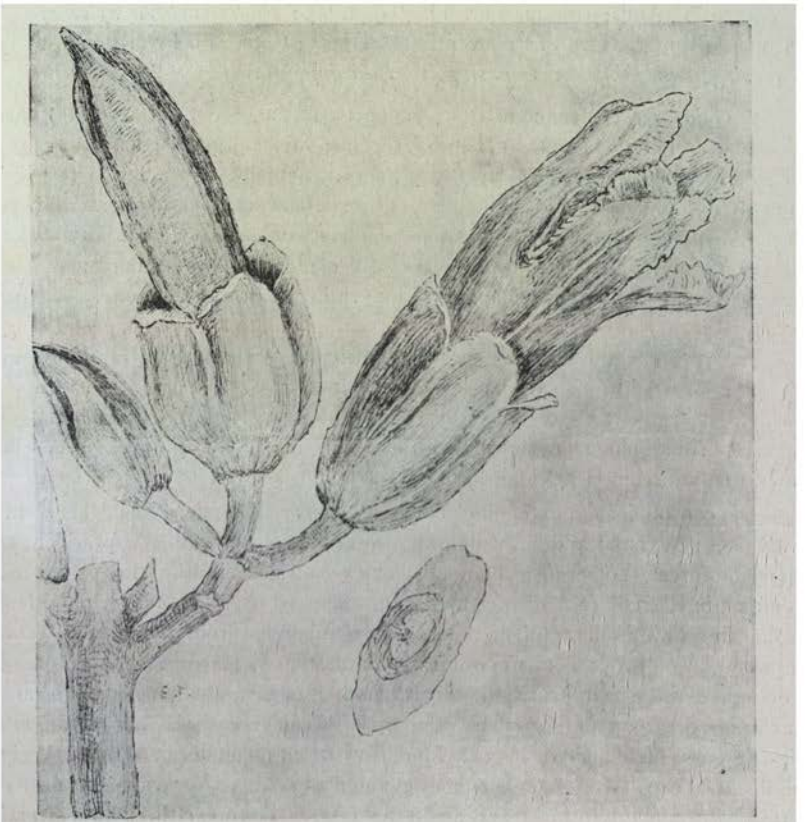

Fig 439. Pajanelia Rheedii, DC.

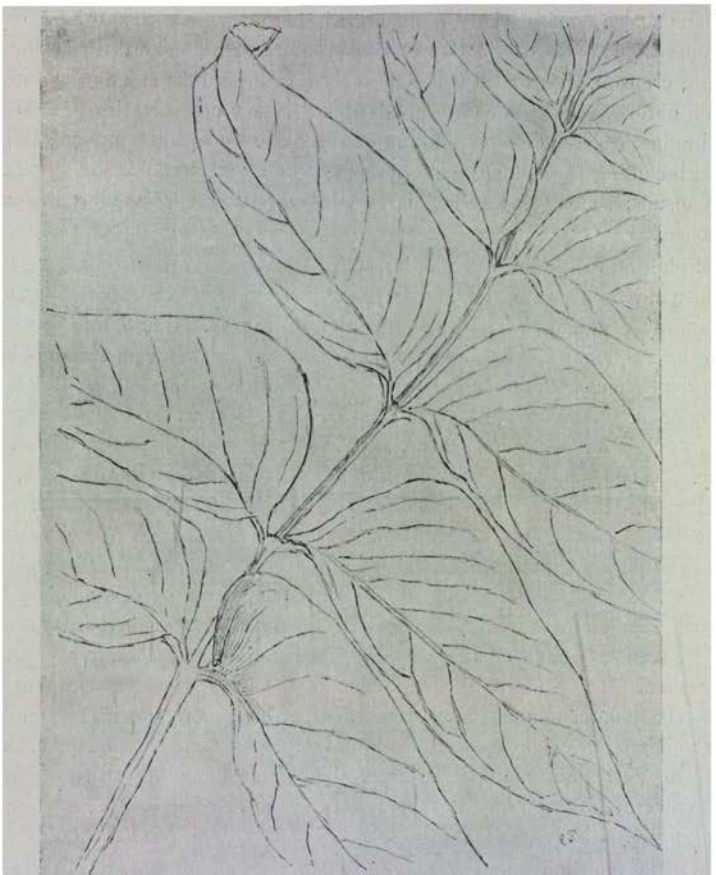

Fig 440. Pajanelia Rheedii, DC.—*leaf.*

. A medium-sized or small deciduous tree; young shoots quadrangular. Leaves bipinnate, very large 2′-3′ long, aggregated at the ends of the stems and leaving large oblong scars after falling; leaflets 8-12 pairs; lateral-leaflets very obliquely ovate, 4″-8″ by 1·5″-3″, lowest largest, acute at acuminate or the apex, very unequal-sided at the base; lateral-nerves 6-8 on the larger side of the leaflet, 2-3 less on the smaller side, prominent beneath; petiolules ·1″-·2″ long. Flowers in a compound, erect, terminal thyrsus, 3′ long; rachis glabrescent, lenticellate; lateral-panicles alternate; bracts 3-4 at the base of the rachis, thick, linear; bracteoles linear, caducous, about ·1″ long. Calyx about 1″ long, divided halfway down, curved, closed and angular at the apex in bud, covered with minute,

resinous scales outside, viscid-glandular within and filled with a white curdy mucilaginous liquid. Corolla 1·5″-2·5″ long; tube narrow below, very wide at the mouth, crimson, with raised white spots; lobes one third the length of the tube broad, obtuse, yellow, tomentose, crisped. Anther-cells divaricate, dehiscing by longitudinal slits; filaments glabrous at the base. Capsules 15″-20″ long by 3″ broad including the 4 longitudinal wings; wings ·75″ broad 2 on each side of the capsule; seeds ·5″ long, laciniately winged on the margins all round except at the base.

Silhet and the Khasia Hills, Pegu, Tenasserim and the Andamans, Western peninsula, N. Kanara to Malabar, ascending to 2000′. In the Bombay presidency, apparently confined to the lower tree-tier of the N. Kanara rain-forest. The large imparipinnate leaves, long, shallow, cup-shaped, hemispheric leaf-scars and the great panicles of dull crimson flowers crowded at the end of the stem are conspicuous characters. Fl. C. S. Jan.-Mch. Fr. next C. S. Usually a tree about 40′-50′ high but sometimes attains 70′-80′ and 2′ in diameter. Bark brown, scaly. Wood cinerous-grey, soft and light. Pores moderate-sized, equally distributed. Medullary rays moderately broad or fine, dark-coloured. Weighs about 30 lbs. to the cub. ft. Timber not used in N. Kanara. Wight and Brandis were of opinion that there are 2 species an Eastern and a Western included under *P. Rheedii.* The strong durable, ornamental timber described by Gamble in his Indian Timbers from an Andamans specimen is so distinct from the infirm, soft N. Kanara wood that there can be little doubt that 2 different species are concerned. The remarkable phenomenon of the large calyx containing much white curdy mucilaginous liquid is of comparatively rare occurence and so far water containing calyces are known in only 13 species, of Bignoniaceæ, Scrophulariaceæ, Verbenaceæ and Solanaceæ. The liquid, according to Koorders whose exhaustive monograph on the subject is full of interesting details, is produced by secreting hydathodes.

Of the non-indigenous *Bignoniaceæ* many ornamental flowering trees, shrubs and woody-climbers are cultivated in gardens throughout the presidency. Dr. Cooke in his Flora of the Bombay Presidency gives a list of the principal. There are also 2 more or less widely spread trees to be noted in this work, viz. *Millingtonia hortensis,* Linn. f.; *Tecoma Stans,* Juss.

Millingtonia hortensis, Linn. f. Suppl. 291; Fl. Br. I. 4, 377; Bedd. Fl. Sylv. t. 248; Brandis For. Fl. 347; Cooke Fl. Pres. Bomb. 2, 334; Gamble Ind. Timb. 509. *Akas-nimb, kavala-nimb, nimi-chambeli,* M.

A large tree of rapid growth. Leaves opposite, bipinnate, 1′-2′ long. Flowers white, pendant, sweet-scented, in numerous-flowered panicles. Calyx 5-toothed; teeth recurved, truncate. Corolla 5-lobed, with a long slender tube 3″-4″ long, widened into a funnel-shaped, oblique mouth; lobes nearly equal.

Stamens 4, inserted at the base of the mouth of the corolla; anthers 1-celled, the other cell reduced to a small hook. Capsule flat-linear, 12″ long, dehiscing at the edges; seeds surrounded on 3 sides with a broad, hyaline wing.

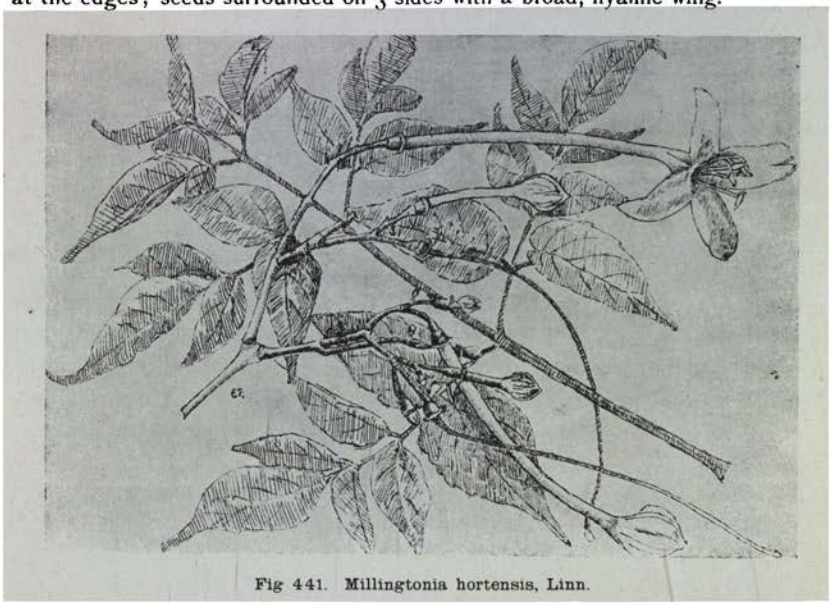

Fig 441. Millingtonia hortensis, Linn.

Indigenous in the Malay Archipelago and tropical forests of Burmah from Ava to Tenasserim, probably also in Central India on the Godavari river. Extensively planted along roadsides and avenues throughout the presidency. Fl. Oct.-Dec. Does not ripen fruit in Western India. A large tall tree with a cylindrical trunk. Bark corky (Dr. Cooke says it is sometimes called *The Indian Cork Tree* in consequence). Wood soft, yellowish, brittle. Pores small, numerous, enclosed in patches of light-coloured tissue forming a more or less concentric, zig-zag pattern. Medullary rays fine. Weighs about 40 lbs. to the cub. ft. Adapted for furniture and tea boxes. "Gets discoloured if it is not cut up fresh and carefully seasoned" Gamble. Reproduction very abundant by means of root-suckers.

Tecoma Stans, Juss. Gen. (1789) 139; Dalz. & Gibs. Bomb. Fl. Suppl. 55; Gamble Ind. Timb. 511; *Stenolobium stans,* Seem.; Cooke Fl. Pres. Bomb. 2, 335.

A large shrub, usually a small tree; branches 4-angled. Leaves sessile, imparipinnate, 4″-6″ long; leaflets 3 pairs and an odd one, lanceolate, 2″-3″ by ·4″-·6″ acuminate, at the apex; cuneate and unequal-sided at the base serrate

or entire; petiolule of terminal leaflet ·5″ long. Calyx campanulate, 5-toothed. Corolla tubular-ventricose, showy, yellow, streaked with red on the inside. Capsule 6″-8″ long, linear; seeds with a thin membranous wing.

Fig 442. Tecoma Stans, Spreng.

A native of South America, planted in gardens throughout the presidency, run wild in the Konkan and N. Kanara, common near the sea-coast at Karwar.

"Bark light-brown corky. Wood light-brown, hard and close-grained. Pores small, rather scanty. Medullary rays fine, the distance between them greater than the diameter of the pores" Gamble.

Order LXVIII.—ACANTHACEÆ.

Herbs, shrubs or trees. Leaves simple, opposite, exstipulate. Flowers irregular, bisexual, bracteate and 2-bracteolate, in spikes, racemes or cymose; bracts rarely O. Calyx 5-lobed or of 5 sepals. Corolla 2-lipped or subequally 5-lobed; lobes imbricate or contorted in bud. Stamens 4-2, inserted on the corolla-tube; anthers 2 or 1-celled, cells sometimes remote. Disk often conspicuous. Ovary superior, 2-celled; ovules one or more in each cell; style filiform; stigma notched or bifid. Capsule loculicidal, often elastically dehiscent, the septum splitting with the seeds on each half. Seeds usually seated on up-curved, acute retinacula, often clothed with white, elastic hairs seen when wetted; albumen O; radicle next the hilum.

An order mostly containing herbaceous genera also the interesting and widely spread genus *Strobilanthes*.

Stamens 4 (2 in *Strobilanthes*, Sec. *Endopogon*).

Corolla 5-lobed, not lipped.

Climbing shrubs. Retinacula O ... ... 1. Thunbergia.

Erect shrubs. Seeds on curved retinacula ... 2. Strobilanthes.

Corolla deeply 2-lipped ... ... 3. Calacanthus.

Corolla 1-lipped, the other lip obsolete ... ... 4. Acanthus.

Stamens 2.

Corolla with a long funnel-shaped tube, 5-lobed; lobes subequal ... ... 5. Barleria.

Corolla with a short tube, 2-lipped; lips subequal.

Lower anther-cells obtuse with a white basal appendage .... 6. Justicia.

Lower anther-cells apiculate without a white basal appendage ... . 7. Adhatoda.

Corolla with a long slender, cylindrical tube, 2-lipped; lips very unequal ... ... 8. Rhinacanthus.

1. THUNBERGIA, LINN. F.

Herbs or climbing shrubs. Leaves cordate, hastate or angular. Flowers (of species mentioned) in axillary, bracteate racemes; bracts leafy; bracteoles 2 at base of each flower, in bud cohering at the margins. Calyx an entire or

indistinctly toothed ring. Corolla white or variously coloured, conspicuous, curved, ventricose with 5, subequal lobes. Stamens 4, didynamous; anthers 2-celled; cells parallel, spurred or not at the base; pollen globose, smooth or minutely tubercled. Disk annular or cushion-shaped. Ovary 2-celled; cells 2-ovuled; style long; stigma funnel-shaped, 2-lobed. Capsule globose, suddenly narrowed into a flat beak, 4-seeded at the base. Seeds 2 in each cell, ovoid or dorsally compressed, glabrous; base plane or excavated; funicle minute or conical.

T. mysorensis, T. Anders. in Jour. Linn. Soc. 9, 448; Fl. Br. I. 4, 393; Cooke Fl. Pres. Bomb. 2, 342; *Hexacentris mysorensis,* Wight Ic. t. 871; Dalz. & Gibs. Bomb. Fl. 183.

A glabrous, twining shrub; branches slender. Leaves ovate-lanceolate, 4″-6″ by 1·25″-2″, acuminate at the apex, acute or truncate at the base, sinuate or toothed; basal-nerves 3 prominent with conspicuous venation between; petioles ·5″-1·5″ long. Flowers large, in long, interrupted, pendant racemes; bracts linear-lanceolate, acute, about ·4″ long; bracteoles ovate, oblong, 1″ long, parallel-nerved, closed in bud. Calyx very shallow, salver-shaped; margins obscurely crenulate. Corolla 2-lipped, 2″ long; tube purple or pink; limb pink spotted or blotched with yellow or brown. Filaments hairy at the base; anthers bearded, with a small spur at the base of each cell. Ovary immersed in the thick disk; style long; stigma cup-shaped. Capsule 1·25″ long, glabrous; seeds ·25″ in diameter, rugose.

Mysore and the Nilgiris; common in rain-forest near the falls of Gairsoppah in N. Kanara otherwise a very rare species within the limits of the Bombay presidency, apparently indigenous. Fl. Dec.-Jan. Fruit not seen. Grown in gardens at Poona and Mahableshwar.

T. fragrans, Roxb. Cor. Pl. 1, 47, t. 67; Fl. Br. I. 4, 390; Cooke Fl. Pres. Bomb. 2, 342. *Chimine,* Vern.

A slender-stemmed twiner with cordate, angular or subhastate leaves, white, axillary, inodorous, large flowers and small dagger-shaped, glabrous, 4-seeded capsules is common throughout the Konkan and N. Kanara in the undergrowth of monsoon or rain-forest.

2. STROBILANTHES, Blume.

Shrubs or herbs. Leaves entire or serrate often lineolate with linear cystoliths conspicuous on the upper or both surfaces. Flowers axillary or in terminal, interrupted or strobiliform spikes or panicles; bracts leafy, persistent or caducous; bracteoles small or O. Calyx 5-divided; lobes equal or unequal. Corolla campanulate; lobes nearly equal. Stamens 4, (2 in *S. reticulatus*); pollen ellipsoid or globose, ribbed or tubercled. Disk small or prominent as a

stalk to the ovary. Ovary 4-ovulate; style linear; stigma of one linear branch the other obsolete. Capsule 4-2-seeded. Seeds compressed, hairy or glabrous; hairs hygroscopically elastic when wetted; retinacula strong, curved.

A large and very interesting genus of usually handsome flowering gregarious shrubs. Of the 146 species described by C. B. Clarke in the Flora of British India 10 are indigenous in the Western peninsula, more than half this number are however endemic in the Bombay presidency. With the exception of *S. callosus* which is found on the comparatively dry Trap region of the Satpudas in Khandesh and Central India, all the other species are confined to favorable localities in the rain-forests of the Konkan and N. Kanara or the moist region of the Western ghâts. *S. callosus* is found gregarious over large areas and its eradication from some of the better class of mixed monsoon-forest is sometimes strongly desirable as it occupies the soil to the exclusion of valuable timber trees. This can be most easily accomplished by cutting the stems after a general septennial flowering before the seed capsules have had time to ripen. The disagreeable penetrating odour of *S. ixiocephalus* and *S. callosus* (in fruit) apparently attracts rather than repels the attacks of insects; in consequence of which the foliage of the former is more or less damaged and destroyed over considerable areas and it is often difficult to collect satisfactory or undamaged specimens for the herbarium. A large proportion of the capsules of *S. callosus* resulting from the general flowering in 1887 were completely destroyed by boring insects. *S. ixiocephalus, S. Heyneanus, S. scrobiculatus,* and *S. ciliatus* flower annually; the remaining species only after periods of 7 or 8 years. The ghât Kumbis in the Belgaum district declare that *S. sessilis* flowers generally every 15 years. Isolated stems and clumps of *S. sessilis, S. reticulatus, S. callosus* and more rarely of the other species are found to flower annually. *S. perfoliatus* and *S. scrobiculatus* are particularly remarkable for their handsome flowers the latter is quite worth introducing into garden cultivation.

Stamens 2 ... ... 1. S. reticulatus.

Stamens 4.

Seeds glabrous.

Stems 4-winged ... ... 2. S. barbatus.

Stems not winged.

Leaves coriaceous, smooth, glabrous.

Spikes hairy ... ... 3. S. warreensis.

Spikes glabrous ... ... 4. S. ciliatus.

Leaves membranous, rugulose, hairy .... 5. membranaceus.

Seed elastically hairy when wetted.

Flowers is dense cymose heads or spikes; bracts imbricating.

Flowers in simple or sub-umbellate spikes ... 6. S. lupulinus.
Flowers in subglobose, glabrous heads ... 7. S. Heyneanus.
Flowers in viscous-hairy, ovoid heads ... 8. S. ixiocephalus.
Flowers in small, subglobose, ciliate heads ... 9. S. minor.
Flowers in short, viscous-hairy spikes on the naked branches .... 10. S. scrobiculatus.
Flowers strobilate; bracts imbricating.
Leaves petioled .... 11. S. callosus.
Leaves sessile ... ... 12. S. sessilis.
Flowers in lax, viscid-hairy spikes; bracts not imbricating .. .. 13. S. perfoliatus.

1. **S. reticulatus,** Stapf, in Kew Bull. (1894), 347; Cooke Fl. Pres. Bomb. 2, 366. *Akra,* M.

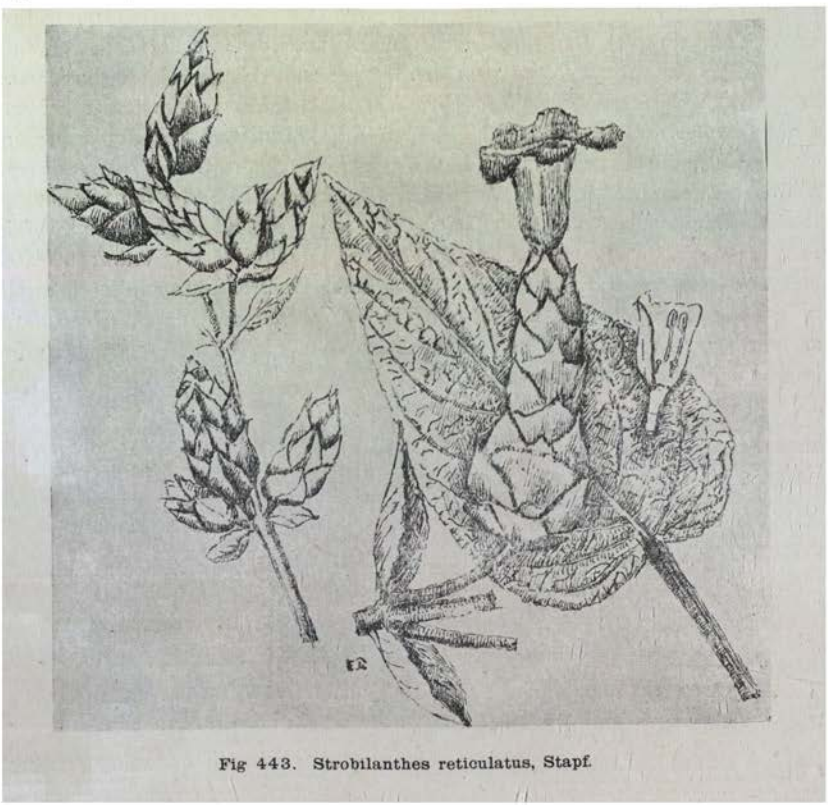

Fig 443. Strobilanthes reticulatus, Stapf.

A small gregarious shrub, growing in clumps of numerous (20-50) annual, mostly simple stems from a thick fibrous root; stems quadrangular, grooved, thickened at the nodes, substrigose with short, flattened white hairs. Leaves ovate, 2″-4″ by 1·25″-2·1″, acuminate at the apex, cordate at the base, crenate, coriaceous, dark-green, substrigose above, pale and substrigose on the nerves beneath; lateral-nerves 6-9 pairs arching upwards, prominent; petioles ·5″-2·5″ long, broadly winged at the top. Flowers in axillary or terminal, pedunculate, ovoid spikes, (one or more on each peduncle) each 75″ long; peduncles 1-2 in each leaf-axil, or 2-3 terminal, fascicled, quadrangular, 0-2″ long; bracts broad-ovate, ·5″ long, acute, glabrescent and glandular-ciliate on the margins; bracteoles O. Calyx-lobes linear with brown tips and ciliate with long, spreading, white hairs on the margins. Corolla 1″ long, purple, hairy within at the top of the ventricose part, sparsely hairy outside; lobes broad-ovate, overlapping to the left in bud. Stamens 2, with 2 small staminodes below; filaments with long spreading white hairs; anthers flat, ovate, yellow; pollen ellipsoid, echinate and longitudinally striate. Capsule obovoid, ·3″ long, glabrous, 4-seeded; seeds with large areoles, hairy on the margins when wetted.

On the higher Deccan ghâts 3500′-4500′, apparently endemic; common in exposed mountain grass-land near Anjini, Nasik district and on the Mahableshwar plateau in or near monsoon-forest. Gregarious over small or large areas which present a curious appearance during the hot season when the plant dies and the black stems radiating from the centre like umbrella-ribs resemble in the distance burnt patches of jungle or forest fire-lines. The separate numerous-stemmed clumps are about 3′ high and like those of *Strobilanthes sessilis,* var. *Ritchiei,* the leaves of which are however sessile. Like *S. sessilis,* flowering stems are found here and there annually during October. Fr. ripe after C. & H. S. The natives at Mahableshwar say that a general flowering takes place every 7 years.

2. S. barbatus, Nees in Wall. Pl. As. Rar. 3, 85; Fl. Br. I. 4, 437; Cooke Fl. Pres. Bomb. 2, 368; *S. tetrapterus,* Dalz. in Kew Jour. Bot. 342; Dalz. & Gibs. Bomb. Fl. 187.

A large shrub; branches quadrangular, glabrous, more or less broadly 4-winged. Leaves broadly ovate, 4″-8″ by 2″-4·5″, shortly acuminate at the apex, narrowed into a winged petiole at the base, slightly unequal-sided and margins entire or crenulate, coriaceous, glabrous, shining and conspicuously lineolate above, paler beneath; lateral-nerves 10-12 pairs, parallel and curving upwards, prominent beneath; petioles 1″-2″ long, winged and auricled at the base. Flowers white in axillary or terminal, subsessile, simple or 2-4-fascicled heads or short spikes 1″-2″ long; bracts imbricate, squarrose or sub-orbicular, with a long, slender acumination, ciliate; bracteoles linear cuspidate, ciliate. Calyx deeply divided into 5 linear, cuspidate lobes, ·5″ long, ciliate on the

margins Corolla ·5″-·75″ long with a tube cylindrical in the lower half, and broad campanulate in the upper; lobes ·25″ long, ovate-acute, hairy within, sparsely white-hairy outside. Stamens 4, shortly exserted; longer filaments bearded, shorter hairy at the base only. Style glabrous. Capsule 2-seeded, clavate, pointed, ·5″ long, surrounded by the viscous-hairy bracts, bracteoles and calyx-lobes; seeds broad-ovate, ·3″ long, glabrous, thin, exareolate.

Western peninsula from Bombay to Cape Comorin up to 3000′; Konkan and N. Kanara, gregarious in rain-forest mostly near nallahs and in very damp localities. Bababuden Hills Mysore in monsoon-forest. Flowers once every seven years during Sept.-Oct. Fr. Apl.-May. Easily distinguished by its 4-winged stem from the other species of *Strobilanthes* growing in the presidency. Dalzell states that it is sometimes subscandent.

3. S. warreensis, Dalz. in Hook. Jour. Bot. 2, 341; Dalz. & Gibs. Bomb. Fl. 187; Cooke Fl. Pres. Bomb. 2, 370.

A small shrub; branches subquadrangular or terete, spreading, smooth, thickened at the nodes. Leaves lanceolate, 3″-6″ by 1″-2″, acuminate at the apex, narrowed into the petiole at the base, serrate or repand-dentate, dark-green, glabrous and conspicuously lineolate above, pale beneath; lateral-nerves 6-7 pairs, parallel and arching upwards, strong on both surfaces; petioles ·25″-3″ long, more or less winged by the decurrent leaf-blade. Flowers axillary, in peduncled spikes 1″-2″ long; peduncles jointed, pubescent or white-woolly; bracts narrowly elliptic, ·3″ long, densely glandular-pubescent; bracteoles linear, ·5″ long, obtuse. Calyx deeply 5-divided, ·3″ long, much enlarged in fruit; lobes linear, one longer than the others. Corolla white, ·5″ long, glabrous outside, sparsely hairy within; tube campanulate above, narrow cylindrical below; lobes short, obtuse, purple-spotted. Stamens 4, longer filaments bearded. Capsule linear-ovoid, ·5″-·75″ long, pubescent, exserted from the glandular-hairy calyx; seeds flattened, ovoid, about ·1″ long, yellowish shining, longitudinally veined, glabrous, with thickened margins.

Western peninsula from the Konkan to South Kanara up to 3000′ in rain-forest probably endemic; common in N. Kanara near the Nilkund ghât, "The Warree country" Dalzell. Fl. Oct. apparently annually. Fr. ripe Feb.

I am unable to distinguish between this species and *S. ciliatus,* of which the fruit is unknown. All my specimens of *S. warreensis,* are in fruit and all of *S. ciliatus,* in flower; both collected in the same locality. Beddome is also of the same opinion vide synonym below description of *S. ciliatus,* in his Ic. Pl. Ind. Or.

4. S. ciliatus, Nees in Wall. Pl. As. Rar. 3, 85; Fl. Br. I. 4, 439; Bedd. Ic. Pl. Ind. Or. t. 211; Wight Ic. t. 1517; Cooke Fl. Pres. Bomb. 2, 369.

A small shrub; branches subquadrangular or terete, glabrous, thickened at the nodes. Leaves ovate or ovate-lanceolate, 2″-5″ by 1·5″-2″, acuminate at the apex, narrowed into the more or less winged petiole at the base, serrate or repand-dentate, lineolate on both sides, densely so above, thinly coriaceous, dark-green above, pale beneath; lateral-nerves 6-7 pairs, prominent beneath; petioles ·5″-3″ long, more or less winged. Flowers in small, peduncled, simple, often deflexed, glabrous spikes, 1″-3″ long; peduncles jointed and bracteate about the middle; bracts on the spike ovate, ·25″ long, acute, glabrous; bracteoles shorter than the calyx, linear, mucronulate, glabrous. Calyx ·25″ long; lobes subequal, glabrous. Corolla white, ·5″ long, campanulate; lobes spotted-purple at the base. Filaments of longer stamens bearded. Capsule not seen.

Same areas of distribution as *S. warreensis*, with which I think it should be united; in which case the name "*ciliatus*" would have priority as it was published in 1832. Dalzell's *S. warreensis* dating from 1850 only.

5. S. membranaceus, Talb. Trees Bomb. ed. 2, 261; Cooke Fl. Pres. Bomb. 2, 373.

Fig 444. Strobilanthes membranaceus, Talb.

A stout, gregarious shrub; branches subquadrangular, grooved, thickened at the nodes, glabrescent or hairy. Leaves broadly ovate, 2″-7″ by 1″-·4, acuminate

at the apex, narrowed into the petiole and unequal-sided at the base, crenate-serrate, thin membranous, rugulose, hispidulous and strongly lineolate particularly on the upper surface with the cystoliths stellately arranged round flattened white silvery, bulbous-based, 2-4-celled hairs; lateral-nerves 6-8 pairs, parallel, strong beneath with prominent, parallel cross-veins; petioles ·5″-3″ long. Flowers axillary, peduncled, in simple, ovoid heads, 1″-1·5″ long, densely viscous-hairy in fruit; hairs mostly 2-5-cellular; peduncles terete or quadrangular, grooved, jointed usually near the top, glabrous; joints with 2 small, leafy, broad-ovate, concave bracts; bracts ·5″ long, scarious, reticulately-veined, and more or less viscous-hairy outside; bracteoles O. Calyx deeply divided almost to the base; lobes subequal, obovate, ·25″-·4″ long, glabrous. Corolla ·5″ long; tube very short; limb ventricose, hairy inside; lobes short, obtuse. Stamens 4; filaments hairy at the base; pollen ellipsoid, longitudinally banded. Capsule oblong, ·3″ long, pointed, glabrous, 4-seeded; seeds ·1″ in diameter, yellow, exareolate, glabrous shining.

N. Kanara, gregarious in monsoon and rain-forest; common in the jungles near Anmode, Supa taluka also near Yellapore. Flowers apparently after long intervals during the cold season in November. Fr. Jan. Feb.

6. S. lupulinus, Nees in Wall. Pl. As. Rar. 3, 85; Fl. Br. I. 4, 443; Cooke Fl. Pres. Bomb. 2, 367; *S. Dalzellii,* T. Anders. ms. in Herb, Kew.

A low gregarious shrub; branches grooved, muricate; branchlets subquadrangular, hairy. Leaves ovate, 1·5″-4″ by ·75″-2·5″, acuminate at the apex, acute or narrowed into the petiole at the base, crenate-serrate, thin, membranous, glabrous, lineolate above and pubescent with short flat, shining hairs, pale and pubescent beneath; lateral-nerves about 7 pairs, slender, distinct; petioles ·5″-1·5″ long, pubescent. Flowers in short, axillary, peduncled and terminal usually simple spikes 1″-2″ long; bracts scarious, obovate, ·25″-1″ long, concave, veined pubescent. Calyx ·3″ long, deeply 5-divided; lobes linear-oblong, scarious, hairy at the apex. Corolla pale-blue, about 1″ long, hairy within, glabrous outside. Capsule oblong-clavate, ·5″ long, 4-seeded, glabrous; seeds exareolate, thin, yellow, quite glabrous.

Western peninsula from the Konkan to Courtallum; Konkan and N. Kanara ghâts in rain-forest, common near Yellapur and on the Rąm and Coessi ghàts. Fl. C. S. Fr. C. & R. S.

S. membranaceus, S. lupulinus, and *S. Heyneanus* are closely allied but distinct species.

7. S. Heyneanus, Nees in Wall. Pl. As. Rar. 3, 85; Fl. Br. I. 4, 443; Dalz. &. Gibs. Bomb. Fl. 187; Cooke Fl. Pres. Bomb. 2, 366; *S. rugosus,* Wight Ic. t. 1619; *S. asperrimus,* Dalz. & Gibs. Bomb. Fl. 187. *Akra,* M.

A large or small, gregarious spreading shrub; branches obtusely quadrangular, pubescent. Leaves broadly ovate, 2″-6″ by 1·25″-3″, acuminate at the apex, narrowed into the petiole and unequal-sided at the base, crenate-serrate, membranous, sparsely white-hairy and lineolate on both sides; hairs flat, white-shining, bulbous at the base; lateral-nerves 8 pairs, parallel, distinct on the pale surface beneath; petioles ·5″-3″ long. Flowers in short, usually simple, axillary or terminal, peduncled, glabrous, ovoid spikes 1″-2″ long; peduncles ·5″-2″ long; bracts elliptic, concave, longer than the calyx, white scarious, reticulately veined; lowest two deflexed; bracteoles O. Calyx ·3″ long, deeply divided; lobes linear obtuse, lineolate, scarious, glabrous. Corolla ·75″ long, light-blue, glabrous without, pubescent within. Filaments of the longer stamens bearded. Style hairy. Capsule clavate, ·3″ long, bluntly pointed; seeds suborbicular, flattened, yellow, glabrous.

Western peninsula from the Konkan to the Bababuden Hills Mysore and Nilgiris, Konkan and N. Kanara; common in rain-forest between the Nilkund and Gairsoppah ghâts. Flowers annually in Nov. and Dec.

Differs from *S. lupulinus* principally by its glabrous spikes, Sir G. King considered the two identical.

Fig 445. Strobilanthes ixiocephalus, Benth.

8. S. ixiocephalus, Benth. in Flora, 33, 557; Fl. Br. I. 4, 414; Bedd. Ic. Pl. Ind. Or. t. 203; Cooke Fl. Pres. Bomb. 2, 327; *S. Neesianus*, Wight Ic. t. 1523; Dalz. & Gibs. Bomb. Fl. 188; *S. glutinosus*, Grah. Cat. Bomb. Pl. 162, not of Nees. *Gurgi* or *Pit-Karvi*, K.

A low much-branched gregarious shrub; branches terete, glabrous or pubescent, sometimes with long, white woolly hairs. Leaves in unequal pairs, broadly elliptic, 3″-6·5″ by 1·5″-3″, acuminate at the apex, acute and

unequal-sided at the base, crenate-serrate, densely lineolate on both sides, pubescent, particularly so on the nerves and venation; lateral-nerves 8-10 pairs, parallel, prominent beneath with cross, parallel venation; petioles 1″-3″ long. Flowers in axillary, peduncled, short, ovoid, simple or corymbose, viscidly hairy spikes ·5″-1·5″ long and with a peculiar, penetrating, unpleasant smell; bracts ovate, ·5″ long by ·25″ broad, shortly acuminate, viscous-hairy. Calyx ·5″ long, divided nearly to the base; lobes ligulate. Corolla pale-blue or sometimes nearly white, ·75″-1″ long, glabrous outside, pubescent within. Filaments hairy near the base; pollen globose, echinate. Capsule 2-seeded, obovoid, ·5″ long, surrounded by the enlarged, shining, viscid, leafy bracts; seeds thin, ovoid, with a small areole, elastically hairy when wetted, densely so on the margins.

Western peninsula, apparently endemic; throughout the Konkan ghâts, common in N. Kanara, gregarious over considerable areas from the coast inland in both rain and monsoon-forest, often on laterite. Flowers annually during the C. S. Fr. H. S.

9. S. minor, Talb. Trees Bomb. ed. 2, 262; Cooke Fl. Pres. Bomb. 2, 372.

A small shrub 1′-2′ high with numerous, spreading branches; branches terete, glabrous. Leaves ovate, 1·5″-3″ by ·75″-1·75″, acute or shortly acuminate at the apex, narrowed into the petiole and slightly unequal-sided at the base, repand-crenate, thin, sparsely hairy and densely lineolate above, pale beneath, ciliate; lateral nerves 4-6 pairs, slender; petioles ·25″-1″ long, pubescent. Flowers in dense, peduncled, globose heads ·3″-·4″ in diameter; peduncles ·1″-·2″ long, jointed and with 2 small, leafy, deflexed bracts about the middle; bracts broadly ovate, ·3″-·4″ long, obtuse, lineolate above, sparsely hairy on the nerves beneath, ciliolate; bracteoles linear-oblong, shorter than calyx-lobes, ciliate. Calyx deeply divided nearly to the base; lobes subequal, oblanceolate, ·25″ long, obtuse, veined, ciliate. Corolla light-blue, ·5″ long; tube short; limb ventricose with 5 short, obtuse lobes, slightly hairy outside, densely so within. Stamens 4; filments hairy; pollen globose with a small boss or neck at the top, echinate. Style 1″ long, entire or with a shortly unequally 2-lobed stigma. Capsule not seen.

Banks of the Kalanuddi near Supa, in the N. Kanara district, allied to *S. Heyneanus,* and *S. ixiocephalus,* Fl. annually during the C. S.

10. S. scrobiculatus, Dalz. ms.; Fl. Br. I. 4, 455; Cooke Fl. Pres. Bomb. 2, 369.

A small, branched shrub; branches channelled, white, glabrous. Leaves deciduous before flowering, ovate or ovate-lanceolate, 1·5″-2·5″ by ·5″-·75″, acute or shortly acuminate at the apex, acute and unequal-sided at the base, entire or repand-crenate, coriaceous, glabrous, densely lineolate, dark-green above, pale beneath; lateral-nerves 6-8 pairs distinct beneath; petioles ·25″ long. Flowers in

numerous, short, viscous-hairy, axillary, peduncled spikes on the naked branches ·5″-1·5″ long, (much lengthened in fruit); bracts obovate, ·2″ long, obtuse, glandular-hairy; bracteoles linear as long as the bracts. Calyx ·3″ long in flower, enlarged in fruit, deeply divided; lobes linear, obtuse. Corolla ·75″-1″ long, deep-blue, glabrous outside, hairy within; lobes oblong, ·2″ long, obtuse, rounded; margins crenulate. Stamens included; pollen globose, echinate. Capsule acicular, ·25″ long, yellowish, sparsely hairy; seeds ovoid, acute at the apex, hairy when wetted, densely so on the margins.

Endemic in the Bombay Western peninsula; ghàts of the Konkan and N. Kanara, 2-4500′. Gregarious on the Mahableshwar plateau and near the Tinai ghàt in N. Kanara usually along the rocky laterite banks of streams and ravines. Fl. annually during the C. S. from Nov.-Feb. Fr. Mch.-Dec. Cooke states that the Mahableswar plant flowers during November at intervals of some years.

11. S. callosus, Nees in Wall. Pl. As. Rar. 3, 85; Dalz. & Gibs. Bomb. Fl 188; Cooke Fl. Pres. Bomb. 2, 368; *S. Grahamianus*, Wight Ic. t. 1520; Dalz. & Gibs. Bomb. Fl. 187. *Karvi*, Vern.

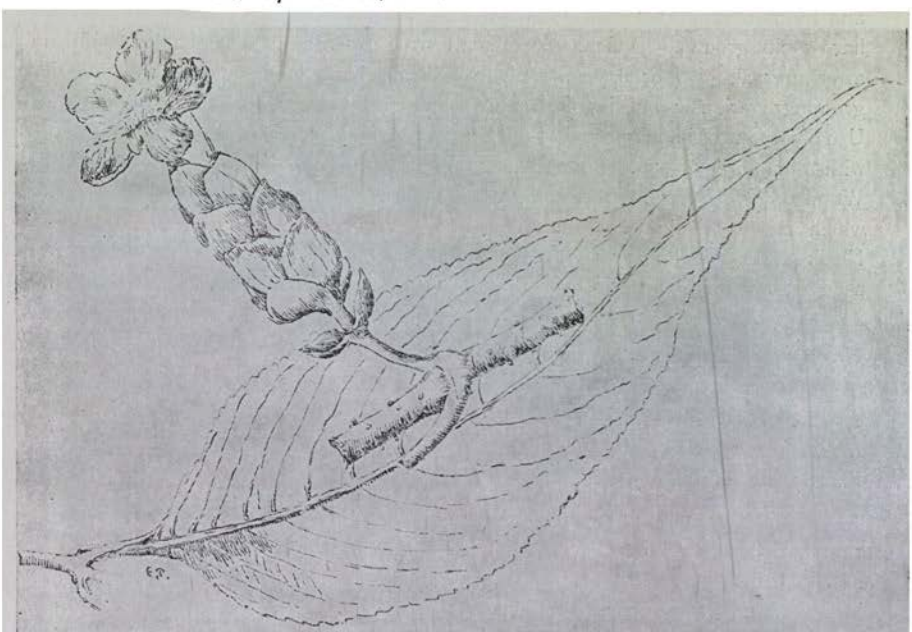

Fig 446. Strobilanthes callosus, Nees.

A large gregarious shrub; stems simple, quadrangular, white, tubercled, nearly glabrous. Leaves in unequal pairs, elliptic-lanceolate, 5″-14″ by 2·25″-5·5″,

acuminate at the apex, cuneate and tapering into the petiole at the base, crenate, densely often stellately lineolate on both sides, dark-green above, paler beneath, sparsely white bristly; lateral-nerves about 18 pairs, parallel, prominent beneath; petioles ·5″-5″ long. Flowers axillary, in obtusely quadrangular, strobiliform spikes 1″-4″ long; peduncles ·5″-1″ long with 1-2 distant pairs of opposite, orbicular, concave, sessile bracts about the middle; bracts ovate, rounded, concave, ·5″-·75″ long, lineolate, green, glabrous in flower, densely viscous-hairy with a strong, disagreeable smell when in fruit; bracteoles O. Disk orange. Calyx ·5″ long, hairy, divided nearly to the base into 5, oblong, nearly equal lobes each with a green, central midrib, enlarged in fruit. Corolla 1·5″ long; tube short, white; limb purple with yellow hairs in the mouth inside; lobes broad, obtuse, ·5″ long, crumpled. Filaments of longer stamens bearded. Capsule obovoid, 2-seeded; ·75″ by ·25″; seeds broadly ovate, ·5″ long, densely hairy when wetted except on the large areoles.

Western peninsula from Bombay southwards. Flowers in Sep.-Oct. Fr. following C. & H. S. Covers large areas on the Konkan and N. Kanara ghâts and forms the undergrowth in many of the monsoon-forests growing on laterite or hard rocky ground. Difficult to eradicate from forest as it flowers and dies down after intervals of 7 or 8 years only. A large simple-stemmed species when it grows gregariously but is often much branched when the stems are isolated. Usually about 6′ in height and ·5″ in diameter, exceptionally attains a height of 30′ with a diameter of 2·5″. Bark thin, grey, hard, smooth or more or less tubercled. Wood yellowish, hard. Pores small, scanty, more numerous in the annual-rings which are very distinct and sometimes as many as 3 to the inch in stems from the Nasik ghâts. Medullary rays fine, numerous, white, distinct. Karvi-stalks are used with a mud plastering for the walls of native huts in Kanara, Khandesh and elsewhere. After a general flowering when the plant dies the dry stems are extensively collected for firewood by the ghât villagers in many parts of the presidency.

12. S. sessilis, Nees in Wall. Pl. As. Rar. 3, 85; Fl. Br. I. 4. 452; Var. *Ritchiei*; Cooke Fl. Pres. Bomb. 2, 366; *S. sessiloides,* Dalz. & Gibs. Bomb. Fl. 187 (not of Wight). *Bukra,* M.; *Harkuni,* K.

A small gregarious shrub growing in distinct clumps; stems obtusely quadrangular, grooved, more or less substrigose. Leaves ovate, 1″-2″ by ·5″-1″, sessile or nearly so, acute at the apex, rounded or cordate at the base, more or less crenate-serrate, lineolate, sparsely pubescent above, substrigose on the nerves beneath; lateral-nerves about 7 pairs, prominent beneath. Flowers in peduncled, axillary or crowded, terminal spikes 1″-3″ long; peduncles 0-1·5″ long; bracts ovate ·75″ long, acuminate, bristly hairy, ciliate; hairs from a bulbous base. Corolla 1·25″ long, purple, hairy outside, sparsely hairy within, densely so at the

insertion of the stamens. Stamens included; longer filaments with long spreading hairs. Style swollen below the stigma. Capsule linear-oblong, ·4" long, acute; seeds brown-hairy all over when wetted.

Western peninsula from the Konkan southwards to Travancore and the Nilgiris up to 6-8000'. In the N. Kanara and Belgaum districts, common on laterite, Konkan ghàts (Var. *Ritchiei)* on trap. Clumps many-stemmed from a thick fibrous root-stock and with much the same habit as *S. reticulatus.* Stems 1·5'-3' high. The stems die down annually. Flowers simultaneously over large areas once every 7 years. On the Belgaum ghâts the natives declare that it flowers generally only once in every 15 years. Scattered flowering-stems and clumps occur annually during Sept.-Oct. Fr. C. S. Nov.-Dec. The variety *sessiloides* found on the Nilgiris has larger more bristly-rugose leaves and larger flowers than the Var. *Ritchiei.*

13. S. perfoliatus, T. Anders. in Jour. Linn. Soc. 9, 471; Fl. Br. I. 4, 458; Cooke Fl. Pres. Bomb. 2, 371; *Leptacanthus alatus,* Wight Ic. t, 1527; *Endopogon integrifolius,* Dalz. in Kew Jour. Bot. 2, 342; Dalz. & Gibs. Bomb. Fl. 185. *Waiti,* Vern.

A large gregarious shrub; stems terete, glabrous, swollen at the nodes. Leaves ovate-lanceolate, often in unequal pairs, 4"-8" by 1·25"-3," long-acuminate at the apex, tapering and unequal-sided at the base, entire or sparingly toothed, lineolate, otherwise glabrous above, pale steel-grey and glabrous beneath; lateral-nerves 8-10 pairs, strong beneth; petioles winged by the decurrent leaf blades, auricled. Flowers distant or close together on the 4-angled, grooved rachis, in axillary or terminal simple or panicled spikes, 2"-5" long, often on the old wood, glandular-hairy; bracts not imbricating, linear-lanceolate, ·75" long with a purple midrib, glandular-hairy; bracteoles linear, shorter than the calyx divided nearly to the base into 5 lobes, one longer than the others, ·4"-·5" long, ciliate with long, glandular hairs. Corolla 1"-1·25" long, deep-blue, glabrous outside, hairy within; narrow part of tube longer than the calyx; ventricose part with a dorsal sinus; lobes ·3" long, subequal, rounded and fimbriate on the margins. Stamens included; filaments of longer stamens bearded. Style enclosed in the sinus at the back of the ventricose part of the corolla-tube. Capsule obovoid, ·4" by ·2", with a broad, mucronate beak, flattened, yellow, glabrous; seeds obovoid, mucronate, hairy when wetted; areole small.

Apparently endemic in the Western peninsula, Konkan and N. Kanara 0-4500', usually in or near rain-forest. A shrub 8'-10' high with very handsome blue flowers, a somewhat rare species. A general flowering takes place once every 7 years during the C. S. from Dec.-Mch.

3. CALACANTHUS, T. ANDERS.

A gregarious shrub. Leaves large, entire. Flowers large, purple, in terminal, bracteate, hairy spikes ; bracts and bracteoles herbaceous. Calyx deeply 5-divided; lobes unequal. Corolla purple, deeply 2-lipped; posterior lip narrow, shortly bifid; anterior lip of 3, short, emarginate lobes; lobes contorted in bud. Stamens didynamous; filaments connate at the base in pairs connected by a transverse line or membrane; anthers subequal, oblong, muticous. Disk not prominent. Ovary glabrous, 2-celled, 4-ovulate; style hairy; stigma simple, linear. Seeds supported on retinacula, densely hairy, exareolate.

C. Dalzelliana, T. Anders. ex Benth. & Hook, f. Gen. Plant. 2, 1088; Fl. Br. I. 4, 478; Cooke Fl. Pres. Bomb. 373; *Lepidagathis grandiflora,* Dalz. in Kew Jour. Bot. 2, 138; Dalz. & Gibs. Bomb. Fl. 190. *Metayan,* M.

A gregarious, large, leafy shrub; branches quadrangular, glabrous. Leaves ovate, 3″-6″ by 1·5″-2·5″, acute or acuminate at the apex, tapering into the petiole at the base, glabrescent and indistinctly lineolate on both sides; lateral-nerves 10-12 pairs, parallel, slender, distinct beneath; petioles 0-1″ long. Flowers in terminal or axillary, sometimes interrupted spikes from the upper leaf-axils, 1″-6″ long; bracts herbaceous, elliptic-lanceolate, penninerved, about 1″ long, pubescent and densely ciliate on the margins; bracteoles oblong-lanceolate, shorter than the bracts. Calyx-lobes 5, lanceolate, ·5″ long, unequal, 3-lobed, 3-nerved; one lobe oblong, two linear-lanceolate and two narrowly oblong. Corolla 1·5″ long, sparsely white-hairy outside; upper-lip 2-fid; lower 3-lobed, bullate, with 2 rows of yellow hairs down the centre. Stamens 4; filaments glabrous; anthers ciliate, sub-sagittate at the base. Ovary glabrous; style hairy. Capsule obovoid, ·75″ long by ·3″ in diameter, acute, compressed, pubescent; seeds about ·3″ in diameter, densely hairy, exareolate.

Western ghâts of the Bombay presidency apparently endemic; gregarious in small patches in moist open situations near rain-forest in the Supa taluka of N. Kanara; on the Konkan ghâts at Matheran also found in the Southern Mahratta country on the Parva ghàt. Fl. annually in Oct.-Nov. Fr. Jan.

4. ACANTHUS, LINN.

Erect or twining shrubs or herbs. Leaves pinnatifid, toothed, often spinous. Flowers blue or white, in terminal, dense, strobiliform or interrupted, bracteate spikes, bracts large, ovate, spinescent or small; bracteoles large, lanceolate, rarely O. Calyx 4-partite; lobes in 2 pairs; outer larger. Corolla 1-lipped; lip obtusely 3-lobed; tube short, ovoid, horny. Stamens 4, didynamous; filaments stout, curved below the anthers; anthers oblong, bearded. Disk obsolete.

Capsule compressed, 4-seeded. Seeds large, flat, glabrous, on thick retinacula; testa very lax.

A. ilicifolius, Linn. Sp. Pl. (1753), 639; Benth. Fl. Austral. 4, 548; Fl. Br. I. 4. 481; Cooke Fl. Pres. Bomb. 2, 351; *Dilivaria ilicifolia,* Nees; Dalz. & Gibs. Bomb. Fl. 192. *Sea-Holly. Márándi, moránná,* M.

An erect, littoral, sparingly branched shrub with cylindrical, glabrous stems. Leaves resembling those of the *Holly,* 3″-6″ by 2″-2·5″, acute or truncate at the apex, acute at the base, pinnatifid with 2-5, large, spinous teeth on each margin at the ends of the lateral-nerves and midrib, coriaceous, glabrous, shining; stipular-spines 2, about ·5″ long. Flowers sessile, in opposite pairs arranged in terminal, crowded or interrupted spikes 4″-15″ long; bracts and bracteoles ovate, ·25″-·5″ long, mucronate, glabrous. Calyx-lobes elliptic-oblong; outer pair ·7″; inner pair ·5″ long, ciliate at the apices. Corolla 1·5″-2″ long, blue; lip nearly 1″ broad, pubescent within, shallowly 3-lobed; lobes rounded, middle lobe much the smallest. Stamens 1″ long; filaments thick; anthers bearded. Style exceeding the stamens. Capsule oblong, 1″ long, brown, glabrous shining; seeds broad-ovate, on short retinacula, compressed, ·25″ in diameter; testa wrinkled.

Tropical sea-coasts along tidal rivers and creeks and in tidal swamps; coasts of the Konkan and N. Kanara common. Fl. Apl.-May. Fr. June-July. A conspicuous, gregarious shrub of small economic importance; serves sometimes to bind the mud of tidal-river banks.

5. BARLERIA, Linn.

Perennial herbs or small shrubs, often prickly. Leaves opposite, entire. Flowers large, showy, sessile, usually in dense, lax, bracteate spikes; bracts leafy, small or obsolete. Calyx deeply 5-divided or with 4 distinct sepals in 2 opposite pairs; outer pair much the largest. Corolla funnel-shaped; tube elongate; lobes 5, subequal, deeply imbricate. Stamens 2, exserted; anthers oblong, 2-celled; staminodes 2-3, minute. Disk large, cup-shaped, enclosing the base of the ovary; margins often toothed. Ovary 2-celled; cells each with 2 ovules; style long; stigma shortly bifid or subentire. Capsule oblong, 2-4-seeded below the middle; base not woody. Seeds compressed, usually 4 on large retinacula, appressed silky-hairy or glabrous.

The following is a list of the principal species found within the presidency limits; they are of small economic or sylvicultural importance; several are found locally gregarious in monsoon-forest whereas others are confined to the dry Deccan districts and Sind.

1. B. Prionitis, Linn. *Kalsunda, pivala-koranta,* M. A small, much branched, prickly shrub with yellow, spikate flowers. Throughout the presidency, often in hedges.

2. B. CUSPIDATA, Heyne. A low spinous shrub with axillary, solitary, yellow flowers. Common in the dry Deccan districts.

3. B. BUXIFOLIA, Linn. A prickly leafy undershrub with white or rose-coloured flowers. Konkan.

4. B. ACANTHOIDES, Vahl. A very low, stunted undershrub with large pure-white flowers opening at sunset; bracts reduced to flattened spines. Confined to Sind in the Bombay presidency.

5. B. HOCHSTETTERI, Nees. A low, rigid, much branched undershrub with small, lilac flowers. Confined to Sind in the Bombay presidency.

6. B. LONGIFLORA, Linn. A low, much branched, unarmed shrub with very long, tubular, white flowers. Gregarious in 2 or 3 localities near the ghàt road between Poona and Mahableshwar. Noted for the first time in the Bombay presidency.

6. B. TOMENTOSA, Roth. A small, unarmed, glandular-hairy shrub with rose-coloured flowers. Rare in the Bombay presidency. In dry forests near Badami (Bijapore collectorate).

7. B. CRISTATA, Linn. *Gokran,* M. Herbaceous or a small hairy undershrub with blue flowers. Throughout the presidency in monsoon-forest often cultivated in gardens. Var. *dichotoma,* Prain Beng. Pl. 812. A white-flowered variety, frequently planted near Hindu temples.

7. B. LAWII, T. Anders. A small, slender-stemmed, erect shrub with a large, white, parallel-nerved corolla. Sparsely distributed in some of the N. Kanara monsoon-forests.

8. B. INVOLUCRATA, Nees. var. *elata,* Clarke in Fl. Br. I. 4, 486. A tall gregarious shrub with branches swollen at the nodes and handsome large blue flowers; the tube of the corolla is purple. Common in the Konkan and N. Kanara in moist monsoon-forest.

9. B. MONTANA, Nees. A tall harbaceous species with large blue flowers common in moist monsoon-forest along the ghàts.

10. B. STRIGOSA, Willd. var. *terminalis,* Clarke in Fl. Br. I. 4, 490. A tall, gregarious species with handsome blue flowers. Common on the Fitzgerald ghàts below Mahableshwar in moist monsoon-forest also in N. Kanara.

11. B. COURTALLICA, Nees. A tall, simple-stemmed, herbaceous shrub, with handsome flowers, sometimes gregarious. Corolla blue with a yellow tube. Common in rain-forest on the N. Kanara ghàts.

12. B. GRANDIFLORA, Dalz. A large herbaceous plant with very large, showy, white flowers. A rare species in monsoon-forest near Yellapore, N. Kanara also found in the Konkan.

13. B. GIBSONI, Dalz. *Guru.* Vern. A small under-shrub, with simple, decumbent stems swollen at the nodes. Corolla large, pink. Konkan and N. Kanara ghàts in monsoon-forest. A somewhat rare species.

6. JUSTICIA, LINN.

Herbs or shrubs. Leaves entire. Flowers usually in spikes or panicles, small or middle-sized; bracts large or small; bracteoles narrow or O. Calyx 4-5-divided. Corolla 2-lipped; upper-lip 2-lobed or subentire; lower-lip 3-lobed; lobes imbricate in bud; tube shorter or longer than the limb. Stamens 2; anthers 2-celled; cells oblique, lower spurred with a white, basal appendage. Capsule 2-4-seeded, with a cylindrical, solid, narrow, sterile base. Seeds cordate, scaly or tubercled, glabrous.

Bracts broad, ovate, equal to or longer than the calyx.
An erect shrub. Flowers large; bracts herbaceous 1. J. montana.
A decumbent undershrub. Flowers small; bracts scarious with a green venation ... ... 2. J. Betonica.
Bracts linear-lanceolate, shorter than the calyx.
An undershrub with long, subscandent branches.
Flowers small ... ... 3. J. wynaadensis.

1. J. montana, Wall. Cat. 2471; Fl. Br. I. 4, 525; Cooke Fl. Pres. Bomb. 2, 406; *Hemichoriste montana,* Nees. in Wall. Pl. As. Rar. 3, 102; Dalz. & Gibs. Bomb. Fl. 194; Wight Ic. t. 1538.

A large, much-branched shrub; branches obtusely quadrangular, channelled, glabrescent. Leaves elliptic-lanceolate, 6″-10″ by 2″-3·5″, acute at the apex, attenuate into the petiole at the base, thin, glabrous; lateral-nerves 6-10 pairs, prominent beneath; petioles ·5″-1·5″ long. Flowers white, in terminal, paniculate, often interrupted spikes longer or shorter than the leaves; bracts ovate-oblong, ·25″ long, leafy, softly grey-pubescent; bracteoles half as long as the bracts; pedicels short or O. Calyx deeply 5-divided, ·25″ long; lobes linear-lanceolate, acute, pubescent. Corolla 1″ long, 2-lipped more than halfway down; upper lip oblong, emarginate; lower lip 3-lobed. Filaments densely hairy at the base otherwise glabrous; lower anther-lobes with a long white spur. Capsule 1″ long, clavate, pointed, 4-seeded, puberulous; seeds suborbicular, compressed, very rugose, glabrous.

Western peninsula from the Konkan to the Nilgiris; Konkan and N. Kanara ghâts in rain or monsoon-forest, common in the jungles near Yellapore. Fl. Dec.-Feb. Fr. Jan.-Mch. A large much-branched, leafy shrub 6′-8′ high, often in open situations outside and near rain-forest.

Fig 447. Justicia montana, Wall.

2. J. Betonica, Linn. Sp. Pl. (1753) 15, Var. *ramosissima,* C. B. Clarke in Fl. Br. I. 4, 533; Cooke Fl. Pres. Bomb. 2, 407; *Adhatoda ramosissima,* Nees in Wall. Pl. As. Rar. 3, 103; Dalz. & Gibs. Bomb. Fl. 193. *Sut,* M.

A low, straggling, diffusely branched undershrub; branches striate, glabrous, swollen at the nodes. Leaves sessile or shortly petioled, ovate, 2″-4″ by ·75″-1·5″, acute or shortly acuminate at the apex, acute at the base, entire or distantly crenate-serrate, pale-green, thin, glabrous; lateral-nerves 6 pairs, distinct beneath. Flowers in terminal or axillary, paniculate, continuous, simple or branched spikes; bracts ovate, ·5″-·75″ long, acute or acuminate, thin membranous, white with green nerves, glabrous; bracteoles lanceolate-acute, sometimes falcately curved, shorter than the bracts, white with a green venation, ciliolate. Calyx-lobes linear-lanceolate, ·2″ long, subequal, pubescent.

Corolla white, rose-spotted, ·5″ long, 2-lipped to about the middle; upper-lip emarginate; lower-lip deflexed, deeply 3-lobed; lobes equal, oblong. Filaments hairy at the base; lower anther-lobes with a long, white spur. Capsule clavate, ·6″ long, pointed, 4-seeded at top, pubescent; seeds ovoid, ·1″-·15″ in diameter, somewhat compressed, densely tubercled or sometimes smooth, glabrous.

Throughout tropical India and Ceylon, usually in hedges and near villages, not a forest species. Fl. & Fr. during the C. S. Dec.-Feb. "Leaves used as a poultice to boils etc. in Ceylon" Trimen.

3. J. wynaadensis, Heyne in Wall. Cat. 2,474; Fl. Br. I. 4, 533; Cooke Fl. Pres. Bomb. 2, 409; *Adhatoda wynaadensis,* Nees in DC. Prodr. 11, 406; Dalz. & Gibs. Bomb. Fl. 194.

An undershrub with long slender, subscandent, terete, striate, glabrous branches, slightly swollen at the distant nodes. Leaves ovate, 3″-4″ by 1·6″-2″, acute or acuminate at the apex, acute at the base, lineolate, glabrous above, pubescent or nearly glabrous beneath; lateral-nerves 5 pairs, distinct beneath; petioles ·5″-·75″ long. Flowers solitary, opposite, in simple or branched, axillary or terminal, elongate, interrupted, glandular-hairy spikes; bracts and bracteoles linear-acute, glandular-hairy, shorter than the calyx-lobes. Calyx deeply divided; lobes linear-acute, ·2″ long, pubescent. Corolla about ·5″ long, pink, the palate with purple, transverse lines, 2-lipped, pubescent outside; upper-lip oblong-obtuse; lower-lip 3-lobed, middle lobe broadest. Filaments hairy below, glabrous above; lower anther-cells with white tails. Capsule clavate, ·5″ long, 4-seeded, densely hairy; seeds orbicular, ·1″ in diameter, rugose, tubercled.

Western peninsula from the Konkan southwards to Coorg, 1-3000′; common in the dense undergrowth in rain-forest near Yellapore, N. Kanara also on the Belgaum ghâts. Fl. & Fr. Dec.-Apl. An unimportant species with rather dingy looking flowers.

J. Gendarussa, Linn. f.; Fl. Br. I. 4, 532; Dalz. & Gibs. Bomb. Fl. Suppl. 71; Cooke Fl. Pres. Bomb. 2, 412. *Kala-adulsa, bakas, tao,* M.; *Kara-lakki-gidda,* K.

A branched undershrub of a purple hue cultivated in gardens throughout India as an edging or border for flowerbeds, naturalized near villages and along the banks of nallahs throughout the presidency, probably indigenous in China. A strong-scented plant. Fl. & Fr. Jan.-Mch.

1. ADHATODA, Nees.

Large shrubs with the characters of *Justicia,* Sect. *Betonica,* except that the anther-cells are apiculate at the apex and scarcely spurred at the base.

A. vasica, Nees in Wall. Pl. As. Rar. 3, 103; Fl. Br. I. 4, 540; Dalz. & Gibs. Bomb. Fl. 184; Cooke Fl. Pres. Bomb. 2, 414; *Justicia Adhatoda*, Linn. Sp. Pl. 15; Grah. Cat. Bomb. Pl. 164. *Adulsa, bakus, vasuka,* Vern. *Adsale,* K.; *Adsoge, aduso,* Guz.

Fig 448. Adhatoda vasica, Nees.

A large, leafy, densely-branched shrub sometimes a small tree; branches terete, glabrous; young parts puberulous. Leaves elliptic-lanceolate, 5″-8″ by 1·5″-2·5″, acuminate at the apex, tapering into the petiole at the base, glabrous, dark-green above, pale beneath; lateral-nerves 10-12 pairs, venation pellucid; petioles 1″ long. Flowers in dense, axillary, peduncled, continuous, bracteate spikes near the ends of the branches; bracts herbaceous, ovate, 1″ by ·5″, 5-7-basal-nerved, reticulately veined; bracteoles oblong-lanceolate, acute, ·75″ by ·15″, ciliolate. Calyx deeply divided into 5 lobes, about ·5″ long; lobes oblong-lanceolate, imbricate, 3-nerved, pubescent. Corolla white, pubescent

outside, 1·25″ long; tube ·5″ long, lower part cylindrical, inflated above, upper-lip ovate-oblong, obtuse, ·75″ long, curved, emarginate; lower-lip 3-lobed as long as the upper; lobes deep, oblong, rounded, middle lobe broadest. Disk annular. Filaments long, curved; anther-cells minutely apiculate, not spurred. Capsule clavate, pubescent, ·75″ long; seeds orbicular-oblong, ·25″ long, tubercular-verrucose, glabrous.

Tropical India from the Punjab and Assam to Ceylon and Singapore, commonly cultivated; in waste places near villages and hedges throughout the presidency, sometimes gregarious; abundant in the Deccan and Konkan districts; like *Cassia auriculata* is immune from the attacks of goats and other animals. Fl. at different times throughout the year. Bark smooth, yellowish. Wood reddish-white with a reddish or dark-coloured centre, moderately hard. Pores very small, equally distributed. Medullary rays fine, short, numerous. Weighs about 46 lbs. to the cub. ft. Used for gunpowder, charcoal and brick burning. The leaves and branches are spread as a top dressing on rice fields in the Konkan and along the coast region of N. Kanara also over tobacco-gardens near Jaffna in Ceylon, they are supposed to have the property of killing weeds and insects. The leaves and dried bark are employed in native medicine. Hermann mentions in the Flora Zeylanica that the bark was used in Ceylon to procure abortion whence this name *Ecbolium*. Trimen states in the Flora of Ceylon that the name "*Malabar-nut*" is given to this species in India.

8. RHINACANTHUS, Nees.

Small undershrub. Leaves entire. Flowers sessile or nearly so, solitary or in small cymes arranged in spreading, lax, divaricate panicles; bracts and bracteoles small. Calyx deeply 5-partite; lobes equal, narrow. Corolla white; tube long, slender; limb 2-lipped; upper-lip short, 2-lobed; lower-lip broad, 3-lobed. Stamens 2, inserted in the throat of the corolla-tube; anther-cells superimposed, muticous. Capsule 4-seeded, clavate, with a long, solid base. Seeds compressed, seated on large, hooked retinacula, tubercled.

R. communis, Nees in Wall. Pl. As. Rar. 3, 109; Fl. Br. I. 4, 541; Dalz. & Gibs. Bomb. Fl. 194; Cooke Fl. Pres. Bomb. 2, 415. *Gajkarni, nagamalli,* Vern.

A small shrub with terete, glabrous or pubescent branches. Leaves elliptic-lanceolate, 2″-4″ by ·75″-2″, acute at the apex, tapering into the petioles at the base, lineolate, glabrous; lateral-nerves 8-10 pairs; petioles 0-·25″ long. Flowers white, sessile or shortly pedicelled, solitary or 2-3 together, distant on the divaricate branches of the terminal, pubescent panicles; bracts linear-lanceolate acute. Calyx-lobes linear, ·12″ long, glandular-hairy. Corolla 1″-1·25″ long; tube ·6″-·75″ long, slender, hairy outside; upper-lip bifid, ·3″ by ·12″; lower-lip oblong, ·5″

long, obtuse. Filaments glabrous. Capsule ·75" long, pointed, glabrous; seeds black, tubercled, glabrous.

Throughout India cultivated, perhaps indigenous in the Deccan peninsula and Ceylon; fairly common throughout the presidency in or near monsoon-forest. Fl. Jan.-Apl. Fr. May-June. The bruised roots and leaves are used in native medicine mixed with lime-juice and pepper as a remedy for itch; they contain an acid allied to chrysophanic.

Order LXIX.—VERBENACEÆ.

Herbs, shrubs or trees. Leaves opposite or whorled (in *Vitex*), simple or digitate, exstipulate. Flowers bisexual, usually small or irregular; inflorescence racemose, spikate or cymose; cymes often panicled, bracteate; bracts usually small. Calyx inferior, gamosepalous, 5-4 (rarely 6-8-toothed), persistent. Corolla gamopetalous, 2-lipped or subequally 5-many-lobed; tube cylindric. Stamens generally 4, didynamous; anthers 2-celled; cells parallel, opening longitudinally. Ovary bi-carpellary, entire or 4-lobed, superior, 2-4-celled; cells usually each with 2 ovules; style terminal. Fruit a 1-4-celled drupe; cells each 1-seeded. Seeds erect or pendulous, exalbuminous; radicle inferior.

Inflorescence capitate, centripetal ... ... 1. Lantana.

Inflorescence cymose, centrifugal.

Cymes lax, paniculate.

Corolla regular; tube very short. Trees.

Fruit with 4, 1-celled pyrenes ... ... 2. Callicarpa.

Fruit with 1, 4-celled pyrene ... ... 3. Tectona.

Corolla more or less 2-lipped, without a slender tube. Trees or climbers.

Leaves simple.

Flowers large. Trees ... ... 4. Gmelina.

Flowers very small. Trees or climbers ... 5. Premna.

Leaves digitately 3-5-foliate ... ... 6. Vitex.

Corolla not lipped; tube usually long, slender.

Erect shrubs or small trees ... ... 7. Clerodendron.

Cymes dense, capitate.

Bracts large, involucriform. Fruit dry, indehiscent 8. Symphorema.

Bracts small. Fruit a fleshy, 2-valved capsule 9. Avicennia.

1. LANTANA, Linn.

Rambling shrubs; branches 4-sided, pubescent, scabrous or sometimes prickly. Leaves opposite, simple, crenate, often rugose. Flowers in peduncled, bracteate, globose or ovoid heads or spikes; bracts ovate, conspicuous, exceeding the calyx; bracteoles O. Calyx small, membranous, truncate. Corolla-tube slender; lobes 4-5, unequal, spreading. Stamens 4, didynamous, included; anthers broadly

oblong. Ovary 2-celled; cells each with 1 basal, erect ovule; style short; stigma oblique, subcapitate. Drupe fleshy, containing 2, 1-celled pyrenes. Seeds exalbuminous; radicle inferior.

Branches hairy or strigose not prickly. Flowers in globose heads; bracts acute	1.	L. indica.
Branches prickly. Flowers in ovoid heads, spikate in fruit; bracts acuminate	2.	L. aculeata.

1. L. indica, Roxb. Hort. Beng. 46; Fl. Br. I. 4, 562; Grah. Cat. Bomb. Pl. 156; Cooke Fl. Pres. Bomb. 2, 418; *L. alba,* Schauer in DC. Prodr. 11, 606. *Ghaneri,* M.

A small shrub; branches 4-angled, strigose. Leaves ovate, 1″-2″ by ·6″-1·2″, acute at the apex, narrowed into the petiole at the base, crenate-serrate, pubescent above, softly pubescent beneath; petioles ·25″-·5″ long. Flowers sessile, in axillary, pedunculate, ovoid heads ·5″ long, lengthening into short spikes in fruit; peduncles 1″-3″ long, 4-angled, hairy; bracts ovate, abruptly long-acuminate, smaller upwards. Calyx small, membranous, hairy, ciliate. Corolla purplish, pubescent outside; tube cylindric, yellow, ·15″ long; limb oblique, ·3″ across; lobes unequal, rounded. Filaments very short, slender. Drupe purple, ·15″ in diameter.

Throughout tropical India, Beluchistan, Tropical Africa; on river banks in Bengal one of the commonest weeds; rare in the Bombay presidency, thinly scattered from Guzerat to Dharwar. Fl. & Fr. throughout the year.

2. L. aculeata, Linn. Sp. Pl. 627 (Plunkenet Phyt. t, 233, f. 5); Trimen Fl. Ceyl. 3, 346; Dalz. & Gibs. Bomb. Fl. Suppl. 68; *L. Camara,* Linn. Sp. Pl. 627; Fl. Br. I. 4, 562; Talb. Trees Bomb. ed. 2, 267; Cooke Fl. Pres. Bomb. 2, 419; Gamble Ind. Timb. 524. *Ghaneri, Chadurang,* M.

A large, much-branched, gregarious, prickly shrub; branches quadrangular, grooved, clothed with recurved prickles. Leaves with the odour of black currants when crushed, ovate, 1·25″-2·5″ by ·75″-1·25″, acute at the apex, acute or rounded at the base, crenate-serrate, thick, scabrous above, softly pubescent beneath; lateral-nerves 6 pairs, strong beneath; petioles ·5″-1″ long. Flowers in peduncled, bracteate heads ·5″-1·5″ in diameter; peduncles angled, ·5″-3″ long, dilated at the top, pubescent; bracts ovate or linear, ·2″ long, shorter upwards. Calyx small, membranous, pubescent. Corolla ·25″ long; tube pink; limb pink or orange. Drupe ·15″ in diameter, dull-purple, enclosed in the membranous calyx.

A tropical American shrub run wild in many parts of India; very common in waste places near villages throughout the presidency, often in hedges, sometimes subscandent. Fl. & Fr. throughout the year. The *Lantana* constitutes

a serious evil on cultivated and pasture lands and even in forests is usually objectionable owing to its great vitality and the difficulties of eradication. In Mysore it is considered a good nurse for sandalwood seedlings but on the other hand some consider that it may be the cause of the spike disease in Coorg.

2. CALLICARPA, Linn.

Shrubs or small trees; branchlets stellately-tomentose. Leaves opposite, toothed or subentire. Flowers small, numerous in dichotomous, axillary cymes; bracts minute, linear. Calyx very small, not accrescent; limb minutely 4-lobed. Corolla small, tubular. Stamens 4; anthers exserted, 2-celled, glandular. Ovary imperfectly 2-celled; ovules 2 in each cell; style linear; stigma dilated, obscurely 2-lobed. Drupe small, globose with 4 or fewer 1-seeded pyrenes. Seeds exalbuminous.

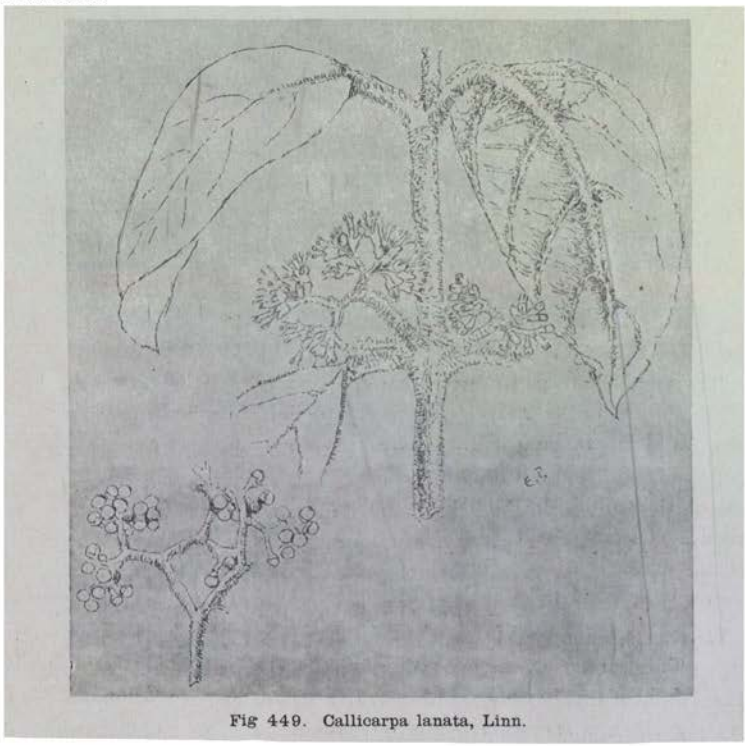

Fig 449. Callicarpa lanata, Linn.

C. lanata, Linn. Mant. 2, 331; Fl. Br. I. 4, 567; Brandis For. Fl. 368; Bedd. Fl. Sylv. 173; Cooke Fl. Pres. Bomb. 2, 423; Gamble Ind. Timb. 525;

C. cana, Dalz. & Gibs. Bomb. Fl. 200 (not of Linn.) *Kan-phulia,* M. *Aisar,* Vern. *Towdatti, mardi, tagdatti,* K.

A small slender-stemmed bushy tree or large shrub; branchlets stout, cylindrical, densely clothed with grey, felted, easily detachable, stellate tomentum. Leaves usually crowded at the ends of the branches, ovate, 5″-7″ by 1·5″-2·5″, acuminate at the apex, acute at the base, entire or more or less distantly crenate-serrate, dark-green, shining above, densely yellowish-grey tomentose beneath; lateral-nerves 6-8 pairs, prominent beneath; nerves and reticulate venation impressed above; petioles ·75″-1·5″ long. Flowers sessile, in short-peduncled, divaricately branched, densely grey-tomentose, axillary cymes about as long as the petioles; bracts minute, linear. Calyx cup-shaped, ·1″ long, very shortly 4-toothed, membranous and densely tomentose outside. Corolla-tube ·1″ long; lobes 4, glabrous, pink or purple, subequal, rounded, recurved, twice as long as the calyx. Stamens exserted; filaments glabrous. Ovary and style glabrous. Drupe globose, ·15″ in diameter, black, smooth, shining.

Western peninsula ascending to 4500′ at Mahableshwar, Ceylon in the moist region up to 4000′ very common; throughout N. Kanara and the Konkan in rain-forest. Fl. Feb.-May. Fr. H. & R. S.

Bark grey, rough, corky. Wood grey, soft and smooth. Pores small, equally distributed. Medullary rays moderately broad and fine, light-coloured, distinct. Weighs 35 lbs. to the cub. ft. The bitter mucilaginous bark as well as the leaves are used in native medicine internally and externally. The tomentose buds serve as a substitute for wick in oil lamps.

3. TECTONA, Linn.

Trees stellately-tomentose. Leaves opposite or in whorls of 3, large, petiolate, entire. Flowers white, in large, terminal, panicled cymes; bracts small, narrow. Calyx campanulate, 5-6-lobed, enlarged, urceolate in fruit. Corolla small; tube short; limb shortly and equally 5-6-lobed. Stamens as many as the lobes of the corolla inserted on the corolla-tube; anthers exserted. Ovary 4-celled; cells each with 1 ovule; style linear; stigma shortly bifid. Drupe 4-celled, enclosed in the accrescent calyx; endocarp bony. Seeds erect, oblong, exalbuminous; cotyledons fleshy, oily; radicle inferior.

T. grandis, Linn. f. Suppl. 151; Fl. Br. I. 4, 570; Dalz. & Gibs. Bomb. Fl. 199; Bedd. Fl. Sylv. t. 250; Brandis For. Fl. 354; Cooke Fl. Pres. Bomb. 2, 424; Gamble Ind. Timb. 526. *Sagwan, sag,* M. *Tegina,* K. *The Teak Tree.*

A large deciduous tree; branchlets quadrangular, channelled, with a large pith, grey stellately-tomentose. Leaves elliptic or obovate, 12″-24″ by 6″-12″, much larger in seedlings and coppice-shoots; upper surface rough, glabrous;

under surface stellately grey-tomentose; lateral-nerves 8-10 pairs branched near the margins, prominent; transverse-veins parallel, numerous; petioles 1″ long. Flowers shortly pedicelled, in erect, cymose panicles 1′-3′ long; bracts below the calyx linear-lanceolate, ·1″ long. Calyx ·12″ long, stellately-tomentose; lobes short, spreading; in fruit the calyx is enlarged to about 1″ long, inflated, crumpled and reticulately-veined. Corolla-tube ·08″ long; limb when expanded ·25″ across; lobes subequal. Fruit subglobose, more or less distinctly 4-lobed, about ·5″ in diameter; pericarp felted-hairy, soft, with a hard, bony endocarp.

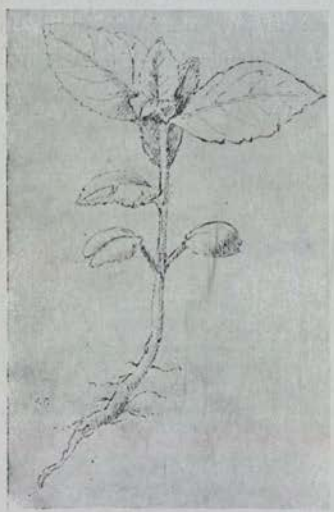

Fig 450. Tectona grandis, Linn. f. *Seedling.*

Western Deccan peninsula, Central and Southern India, Burmah, Malay peninsula, Sumatra and Java; throughout the presidency in monsoon and thorn-forest. Fl. June-Aug. Fr. ripe Nov.-Jan.

A large or small deciduous tree. Bark grey with shallow furrows and exfoliating in long, thin flakes. Sapwood white usually small; heartwood golden-yellow when freshly cut, turning yellowish-brown, moderately hard, oily, very strong and does not warp or split once properly seasoned, contains an aromatic oil which renders the wood very durable; works easily and takes a good polish. Annual-rings distinctly marked by one or more lines of regularly arranged pores on the margin with moderate-sized pores often subdivided and scattered within the ring. Medullary rays moderately broad, equidistant, fairly numerous. Weighs 39-48 lbs. to the cub. ft. The wood from dead, dominated or fallen trees is lighter and stronger than from trees killed by girdling. From a series of experiments carried out at the Yellapore saw-mills in N. Kanara during 1885 it was found also that the former also possessed greater transverse strength. The value of P. (the coefficient of transverse strength) for naturally dead Kanara teak being 607 against 501 for girdled timber.

The best high-timber teak forests in the presidency are on the well drained slopes of the Kala-nuddi and Gungawuli rivers of N. Kanara in the Supa and Yellapore talukas; they are of limited extent and the annual sustained yield does not exceed 4000 tons of first class timber. It has been estimated that only 8 per cent. of the crop in these forests is teak the principal associated species being *Terminalia paniculata, T. tomentosa* and *Xylia dolabriformis.* Owing to continuous protection from fire and the resultant dense undergrowth, seedling

reproduction is very defective and it will probably be found necessary to clear the ground by a controlled burning throughout the whole of Kanara high-timber Teak area. Teak is found throughout the monsoon-forest formation of Belgaum and N. Kanara but there are large areas apparently with suitable conditions of soil and rainfall from which the species is totally absent. Teak is never found in rain-forest. Away from the ghâts with a rapidly diminishing rainfall the size of the trees becomes smaller and the stems stunted and often defective. Reproduction in this zone of growth is chiefly by coppice shoots and root-suckers. Along the borders of N. Kanara with an annual rainfall from 50″ to 60″ the quickly grown, straight poles are of excellent quality. Further inland in the Dharwar and Belgaum districts the exploitable material consists of poles of small dimensions often short, crooked and damaged by the frequently recurring annual forest fires. In Nasik, Poona and Khandesh, the teak-forests are of considerable extent but the material is like in Dharwar generally of very poor quality. There is a better growth in the Khandesh Akrani also in the Surat Dangs but the jungles of these two regions have been so maltreated by the native inhabitants and damaged by fire that scarcely any sound trees remain and there are not many stems capable of conversion into a one ton log now to be found. In the Khandesh Akrani teak occurs on the plateau near the Turanmal lake at an elevation of 3700′. The stems are short and thick evidently from seedling origin. Teak seldom attains a large size on the Trap in the Bombay presidency and even with a heavy rainfall the forests of Kolaba and Thana only yield pole timber. For a full discussion of the uses of teak see Gamble's Indian Timbers and Watts'. Dictionary of Economic Products.

4. GMELINA, Linn.

Trees or shrubs, unarmed or spinescent. Leaves usually entire. Flowers large, yellowish-brown, tomentose when young, in small, peduncled, paniculate, terminal cymes; bracts usually narrow. Calyx campanulate, 4-5-toothed. Corolla 2-lipped; tube ventricose upwards; limb spreading, oblique, 4-5-lobed. Stamens 4, didynamous; anther-cells oblong, pendulous, subseparate. Ovary 4-celled; ovule solitary in each cell; style slender; stigma shortly bifid. Fruit a succulent drupe; endocarp 2-4-celled, bony; seed oblong, exalbuminous.

An unarmed tree. Leaves fulvous-tomentose beneath 1. G. arborea.

A large shrub often spinescent. Leaves glabrous, glandular beneath ... ... 2. G. asiatica.

1. G. arborea, Linn.; Roxb. Fl. Ind. 3, 87; Fl. Br. I. 4, 581; Brandis For. Fl. 364; Dalz. & Gibs. Bomb. Fl. 201; Bedd. Fl. Sylv. t. 253; Cooke Fl.

Pres. Bomb. 2, 424; Gamble Ind. Timb. 537. *Shivani,* K. *Shivan,* M. *Kasmari,* Vern.

A moderate-sized or large deciduous tree; branchlets fulvous-tomentose. Leaves broadly ovate, 4″-8″ by 3″-6″, acuminate at the apex, rounded or cordate at the base, glabrous above, stellately fulvous-tomentose beneath; lateral nerves 4-6 pairs, lower 2 basal, strong beneath; petioles 2″-3″ long, glandular at the top. Flowers on the naked branches or appearing with the young leaves, large, in small cymes of 1-3 flowers each, arranged in terminal, yellowish-tomentose panicles 6″-12″ long; bracts ·2″ long, linear, tomentose, caducous. Calyx campanulate, ·2″ long, fulvous-tomentose; teeth small, triangular, acute. Corolla 1·5″ long, densely pubescent outside; lobes spreading or recurved; lowest lobe longest projecting forwards, ovate-obtuse. Drupe ovoid or pyriform, about 1″ long, orange-yellow when ripe, smooth; stone ovoid.

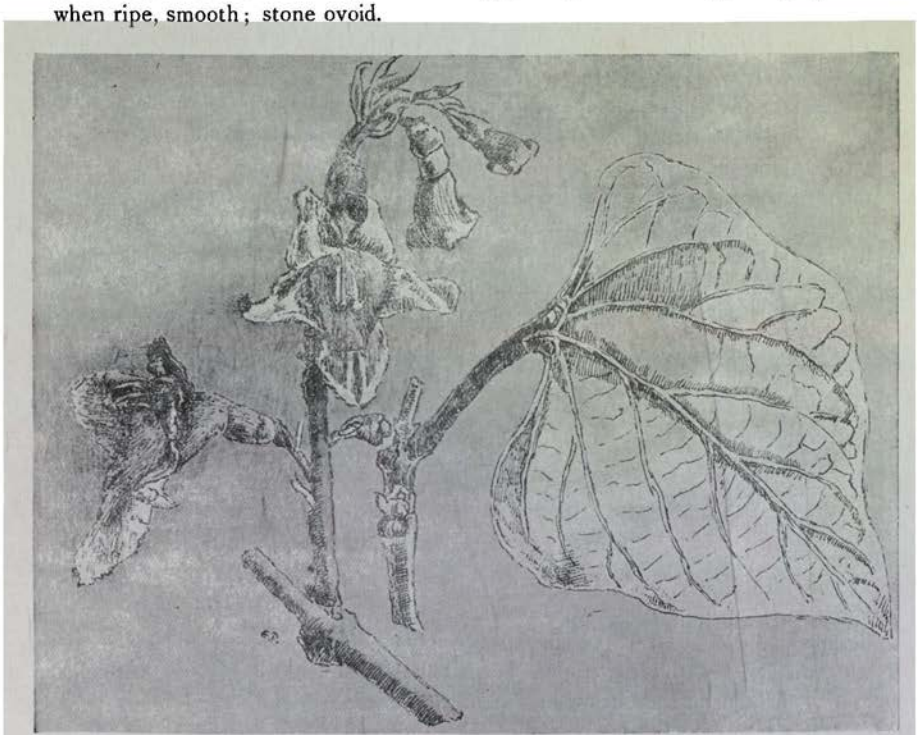

Fig 451. Gmelina arborea, Linn.

Tropical and subtropical India up to 5000′ in deciduous forests, Burmah, Bengal, Chittagong, moist region of Ceylon; throughout the Presidency scattered

in monsoon-forest but nowhere common, on the Turanmal plateau Khandesh Satpudas, 3700'. Fl. Mch.-Apl. Fr. May-June.

A moderate-sized, handsome flowering tree. Bark smooth, greyish-yellow, smooth, corky; inner-bark mottled-yellow, turning quickly brown on exposure to the air. Wood yellowish-grey with a glossy lustre, soft and light. Annual-rings more or less distinct. Pores large and moderate-sized, numerous in the spring wood. Medullary rays moderately broad and fine, visible in the silver-grain as irregular horizontal bands. Weighs 36 lbs. to the cub. ft. Yields an excellent strong, light timber suitable for planking, furniture, panelling, carriages, picture frames and generally for ornamental work; neither warps nor shrinks once properly seasoned. The ripe fruit is eaten by the Khandesh Bhils and other wild tribes. The roots and bark are used in native medicine.

2. G. asiatica, Linn.; Roxb. Fl. Ind. 3, 87; Fl. Br. I. 4, 582; Brandis For. Fl. 365; Bedd. Fl. Sylv. 162; Grah. Cat. Bomb. Pl. 158; Gamble Ind. Timb. 539; Cooke Fl. Pres. Bomb. 2, 425. *Kal-shivani,* K.

A large straggling, sometimes climbing, spinescent shrub; branchlets puberulous often shortened and spinous at the ends. Leaves ovate, ·75″-1·5″ by ·5″-1″, obtuse at the apex, acute or rounded at the base, glabrous, dotted with minute, white glands beneath; petioles ·25″-·5″ long. Flowers large, yellow, nodding, in terminal racemes or panicles; bracts small, caducous. Calyx ·2″ long, cupshaped, truncate, pubescent, with several large glands in the upper part; lobes 4, small, triangular acute. Corolla 2″ long, finely pubescent outside; tube curved, inflated above; lobes 4, subacute, lowest largest. Drupe obovoid or pyriform, ·75″ long, yellow when ripe; stone 1-2-celled and seeded.

Southern India and Ceylon. Doubtfully wild in the Bombay presidency, commonly planted in gardens near Bombay, makes an excellent hedge plant. Fl. throughout the year. Roots and leaves are used in native medicine. The fruit is edible.

5. PREMNA, LINN.

Trees or shrubs, sometimes climbing. Leaves opposite, entire or toothed. Flowers in terminal, corymbose or panicled, thyrsoid cymes; bracts small, narrow. Calyx cupshaped or 2-lipped. Corolla short, tubular; throat hairy; limb 2-lipped or subequally 4-lobed. Stamens 4, didynamous. Ovary 2-4-celled; cells each with 1 ovule; style linear; stigma shortly bifid. Drupe small, globose, 1-4-celled and seeded, surrounded below by the calyx. Seeds oblong.

A large scandent shrub. Corymbs purple. Calyx truncate ... ... 1. P. coriacea.

An erect tree. Corymbs greenish-yellow. Calyx 2-lipped ... ... 2. P. integrifolia.

1. **P. coriacea,** C. B. Clarke in Fl. Br. I. 4, 573; Cooke Fl. Pres. Bomb. 2, 426; *P. scandens,* Dalz. & Gibs. Bomb. Fl. 199, (not of Roxb.) *Chambari, rawan,* M. *Zarangi-balli,* K.

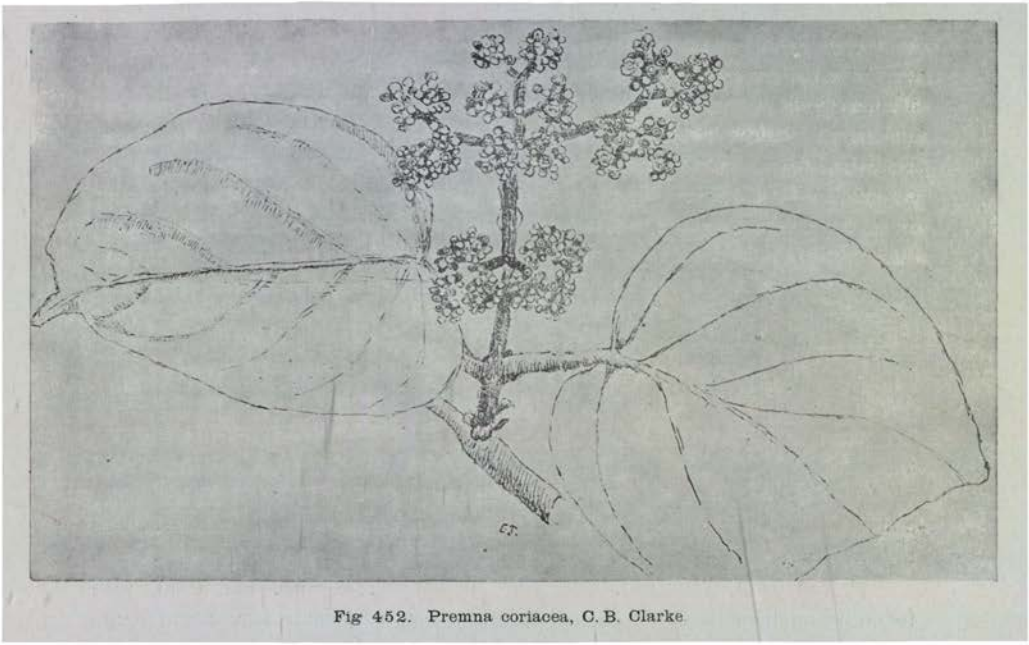

Fig 452. Premna coriacea, C. B. Clarke

A large deciduous climbing shrub; branches striate, glabrescent. Leaves elliptic, 4″-7″ by 2″-5″, shortly and bluntly acuminate at the apex, rounded or cordate at the base, thin, glabrous; lateral-nerves 3-4 pairs, uniting within the margin, strong beneath; petioles ·5″-3″ long. Flowers sweet-scented, in large terminal, paniculate, branched, purple, corymbose cymes; bracts minute, linear-acute. Calyx cupular, truncate, purple. Corolla ·2″ long; tube hairy in the throat inside; lobes 4, white, as long as the tube. Filaments white, hairy at the base; connective globose. Style shorter than the filaments; stigma forked. Drupe ovoid, ·15″ long, smooth, black when ripe.

Western peninsula from Bombay southwards; Konkan and N. Kanara ghâts in rain-forest. Fl. Apl.-May, Fr. ripe June. An ornamental flowering climber. Bark thin, smooth, with round, corky lenticels; inner-bark white, with light-brown fibres. Wood mustard-yellow, light, soft and rough. Annual-rings distinct, marked by lines of large pores. Pores large or small, numerous medullary rays moderately broad, numerous, wavy. Weighs 34 lbs. to the cub. ft.

2. P. integrifolia, Linn. Mantiss. 2, 252; Fl. Br. I. 4, 574; Brandis For. Fl. 366; Gamble Ind. Timb. 535; Grah. Cat. Bomb. Pl. 155; Cooke Fl. Pres. Bomb. 2, 426; *P. serratifolia,* Linn. Mantiss. 2, 253; Bedd. Fl. Sylv. 172; *P. latifolia,* Dalz. & Gibs. Bomb. Fl. 200 (not of Roxb.) *Khárá-narvel, aran,* M. *Arni,* Guz.

A small tree; trunk and branches sometimes thorny; branchlets glabrous or sparsely pubescent. Leaves broadly ovate, 2″-3″ by 1″-1·5,″ shortly obtusely acuminate at the apex, rounded or acute at the base, entire or dentate in the upper half, glabrous; lateral-nerves about 4 pairs; petioles ·25″ long. Flowers white or greenish-yellow with a strong, disagreeable smell, in short, terminal, corymbose, pubescent cymes; bracts minute, linear. Calyx ·1″ long, 4-lobed; lobes obtuse, one at right angles to the tube. Corolla tubular, ·12″ long, lipped; tube hairy in the throat, pubescent or glabrous outside; lobes 4, rounded. Stamens 4; filaments white-hairy, inserted at the top of the corolla-tube,scarcely exserted. Ovary globose, glabrous; style shortly bifid, shortly exserted. Fruit globose, ·2″ in diameter, smooth, blue-black, seated on the accrescent, quadrangular calyx; seed hard, rough tubercled, shortly 2-divided at the top.

India near the sea from Bombay to Malacca and Ceylon, Andamans, and Nicobars; throughout the Konkan and N. Kanara near the sea-coast, common about Karwar in the N. Kanara district. Fl. June-July. Fr. July-Aug.

Bark yellowish, lenticellate. "Wood light creamy-brown, moderately hard and close grained, pleasantly scented. Pores moderate-sized, numerous. Medullary rays fine, close, fairly numerous," Gamble.

P. cordifolia, Grah. Cat. Bomb. Pl. 155; Dalz. & Gibs. Bomb. Fl. 199; found near Khandalla is described as having long-acuminate leaves and rough seeds may be a form of *P. integrifolia,* but cannot be referred to *P. coriacea* as suggested by C. B. Clarke in the Fl. Br. I. *P. Nimmoniana,* Grah. Cat. Bomb. Pl. 155 as pointed out by Dr. Cooke is described as having alternate leaves and cannot therefore belong to the genus *Premna* at all.

6. VITEX, Linn.

Trees or shrubs. Leaves usually digitately 3-5-foliate. Flowers usually small, in axillary or terminal peduncled or sessile cymes, forming large or small panicles or corymbs; bracts longer or shorter than the calyx. Calyx truncate or 5-toothed. Corolla small, tubular, 2-lipped, 5-toothed; central lobe of lower lip largest. Stamens 4, didynamous, exserted. Ovary 2-4-celled; cells each with one ovule; style filiform, shortly bifid. Drupe globose, supported by the more or less accrescent calyx; putamen separating into 4, bony, 1-seeded pyrenes.

Cymes in terminal panicles.

Shrubs or small trees.

Leaves 1-3-foliate; leaflets sessile, white mealy-pubescent beneath ... ... 1. V. trifolia.

Leaves 3-5-foliate; leaflets petioluled, grey-pubescent beneath ... ... 2. V. Negundo.

Large trees.

Leaves 3-5-foliate; common petioles more or less broadly winged ... ... 3. V. altissima.

Cymes axillary, corymbose.

Leaves 3-5-foliate; common petioles not winged 4. V. leucoxylon.

1. V. trifolia, Linn. Sp. Pl. 638; Fl. Br. I. 4, 583; Cooke Fl. Pres. Bomb. 2, 428; Bedd. Fl. Sylv. 172; Brandis For. Fl. 370; Trimen Fl. Ceyl. 3, 356. *Nirgundi,* Vern. *Indrani, lingur,* M.

A stout, much-branched, deciduous shrub or small tree; branchlets pubescent. Leaves 1-3-foliate; leaflets sessile, ovate; terminal leaflet much larger than the lateral, 2″-2·5″ by 1″-1·5″, acute or obtuse at the apex, tapering at the base, densely white-tomentose or mealy beneath; lateral-nerves 4-6 pairs; common petioles ·5″-1″ long, grooved, pubescent. Flowers blue in pedunculate, terminal, tomentose, panicled cymes; bracts minute. Calyx ·12″ long, campanulate; teeth short, triangular, acute. Corolla 2-lipped, about ·5″ long, pubescent outside; upper-lip shortly 2-lobed; lower lip 3-lobed, middle lobe largest. Filaments hairy at the base. Fruit globose, ·25″ in diameter, partly enclosed in the accrescent, white-tomentose calyx. Closely allied to but distinct from *V. Negundo,* Linn.

Konkan, N. Kanara. A rare species. Fl. throughout the year.

2. V. Negundo, Linn. Sp. Pl. 638; Fl. Br. I. 4, 583; Bedd. Fl. Sylv. 171; Brandis For. Fl. 369; Cooke Fl. Pres. Bomb. 2, 428; Gamble Ind. Timb. 539; *V. bicolor,* Willd. Enum. Hort. Berol. 660; Dalz. & Gibs. Bomb. Fl. 201; *V. trifolia,* Grah. Cat. Bomb. Pl. 155. *Nirgud, lingur,* M. *Nirgunda, nengar,* H. *Lekki-gidda, shurnboli,* K. *Nagodz,* Guz. *Indian Privet.*

A large shrub or sometimes a small, deciduous tree; branchlets quadrangular, white-tomentose. Leaves 3-5-foliate; leaflets petioluled, lanceolate, 2″-3·5″ by ·4″-1″; terminal leaflet longest, glabrous above, white-tomentose beneath; lateral-nerves 10-14 pairs; common petioles 1″-1·5″ long. Flowers light-blue or white with a mauve-dotted palate, in pedunculate, tomentose, panicled, terminal cymes; bracts small, linear, caducous. Calyx ·1″ long, white-tomentose; teeth short, triangular. Corolla ·4″ long, pubescent outside; tube hairy within at the insertion of the stamens; 4 upper lobes short, triangular; lowest lobe largest forming a lower lip. Drupe globose, ·2″ in diameter or smaller, black when ripe.

Tropical India and Ceylon; throughout the presidency and Sind, one of the most common and widely spread shrubs in waste lands and hedges also along the

banks of rivers and nallahs and in moist situations in or near deciduous forest; often cultivated. Fl. throughout the year. Bark thin, grey. Wood greyish-white, hard. Annual-rings distinct. Pores small and moderate-sized. Medullary-rays numerous, fine; weighs 42 lbs. to the cub. ft. Used for building purposes and fuel, frequently planted in hedges. The root serves in native medicine as a febrifuge. "Leaves aromatic when crushed, used in Ceylon as a fomentation in rheumatism; the root is employed as a tonic" Trimen. The branches are used in wattle work.

3. V. altissima, Linn. f. Suppl. 294; Fl. Br. I. 4, 585; Dalz. & Gibs. Bomb. Fl. 201; Trimen Fl. Ceyl. 3, 357; Bedd. Fl. Sylv. t. 252; Brandis For. Fl. 370; Cooke Fl. Pres. Bomb. 2, 429; Gamble Ind. Timb. 540. *Bulgi, burnige, nauladimara, naulmitik,* K.

A large or very large tree with a dense crown; branchlets quadrangular, lenticellate, more or less villous. Leaves trifoliate, rarely 5-foliate; leaflets sessile, lanceolate, 3"-6" by 1"-1·75", (terminal leaflet largest), acuminate at the apex, acute at the base, glabrous above, softly pubescent beneath; lateral-nerves about 12 pairs, strong beneath, venation pellucid; common petiole 1·5"-3" long (broadly winged in var. *alata*). Flowers numerous, in shortly peduncled or sessile one-sided, erect, distant cymes arranged along the quadrangular, fulvous-tomentose branches of the large, terminal panicles; bracts oblong, ·15" long, obtuse, pubescent, caducous. Calyx ·1" long, grey-tomentose; teeth obtuse. Corolla ·25" long, white with a bluish tinge, pubescent outside, 2-lipped; upper-lip shortly 2-triangular-lobed; lower-lip 3-lobed, middle lobe much the largest. Drupe irregularly globose about ·25" in diameter, purple, white-dotted, glabrous, seated on the persistent, flattened calyx.

Var. *alata,* Trimen Fl. Ceyl. 3, 358; Cooke Fl. Pres. Bomb. 2, 429; *Vitex alata,* Willd. in Ges. Naturf. Fr. Neue. Schr. 4, 203; Dalz. & Gibs. Bomb. Fl. 201; Fl. Br. I. 4, 584; Talb. Trees Bomb. 271; differs from the type in having the petioles broadly winged; wing broad and cordate at the base. Cymes sessile and flowers more laxly arranged.

Southern and Western India and Ceylon; throughout the rain-forests of the Konkan and N. Kanara, common in the Kumta and Yellapore talukas. Fl. Apl.-May. Fr. June-July.

Usually a very large tree up to 6′ in diameter and 120′ high. Bark grey, scaly, characteristic; inner-bark yellow, fibrous or with rings of darker coloured, yellow tissue. Wood grey-brown with an olive tinge, hard, close-grained and takes a fine polish. Annual-rings distinct, marked by a ring of dark-coloured hard tissue. Pores small or moderate-sized, scanty and equally distributed. Medullary rays fine, short, distinct. Weighs 60 lbs. to the cub. ft. Used for

building purposes, furniture etc. an excellent timber much in demand in the N. Kanara district. "The bark is used as a fomentation in rheumatic swellings. The wood affords a yellow dye which is not much employed" Trimen.

4. V. leucoxylon, Linn. f. Suppl. 293; Fl. Br. I. 4, 587; Dalz. & Gibs. Bomb. Fl. 201; Bedd. Fl. Sylv. 171; Brandis For. Fl. 370; Cooke Fl. Pres. Bomb. 2, 430; Trimen Fl. Ceyl. 3, 358; Gamble Ind. Timb. 542. *Hole-lakki, senkani*, K. *Songarbi*, M. *Sherus*, Vern.

Fig 453. Vitex leucoxylon, Linn.

A large deciduous tree with a short thick trunk; young parts more or less yellow-tomentose. Leaves 3-5-foliate; leaflets elliptic, 2″-4″ by ·75″-1·75″, (lowest pair smallest), obtuse or acute at the apex, acute at the base, dark-green, glabrous, shining above, pubescent near the midrib otherwise glabrous and pale beneath; lateral-nerves about 12 pairs, strong beneath, venation closely reticulate; petiolules ·25″ long; common petiole terete, 1″-2″ long. Flowers fragrant, peduncled, in axillary, corymbose, long-stalked, corymbose cymes; peduncles pubescent, 1″-2·5″ long; bracts short, linear, caducous. Calyx ·12″ long, pubescent; lobes short, triangular, acute. Corolla ·5″ long, white, pubescent outside; lowest lobe much longer than the 4 upper, crisped on the margins and purple hairy in the centre. Drupe obovoid, ·75″ by ·6″, fleshy, purple when ripe, seated on the cup-shaped, enlarged calyx; stone 4-celled and seeded.

Western peninsula and Ceylon; throughout the Konkan and N. Kanara ghâts in rain-forest, usually along the banks of rivers and nallahs, common in the Siddapore and Sircy talukas of N. Kanara. Fl. Feb.-Apl. Fr. May-June.

Trunk very short and thick; crown spreading. Bark smooth, grey. Wood pinkish with a satiny lustre, close-grained and durable. Annual-rings distinct. Pores small, more numerous in the spring-wood. Medullary rays fine and moderately broad, giving a silver grain. Weighs 40 lbs. to the cub. ft. Not much in demand in the N. Kanara district. Beddome states that it is used for cart-wheels in the Madras presidency and deserves attention for furniture. Like many other excellent timbers in N. Kanara the forests in which it is found are far away from the centres of consumption.

7. CLERODENDRON, Linn.

Shrubs or small trees. Leaves simple, opposite or whorled. Flowers in small cymes usually combined in axillary or terminal, corymbose panicles. Calyx campanulate, 5-toothed or lobed, often accrescent in fruit. Corolla-tube long, cylindric; lobes 5, spreading, more or less subequal. Stamens 5, didynamous, long-exserted. Ovary 2-4-celled; cells each with 1 ovule; style shortly bifid. Fruit a dry or succulent drupe normally with 4 pyrenes (1-3 often suppressed). Seeds oblong, exalbuminous.

Leaves opposite. Flowers white.
- Inflorescence in few-flowered axillary cymes.
  - Calyx accrescent in fruit, slightly lobed or truncate ... ... 1. C. inerme.
- Inflorescence in axillary or terminal panicles.
  - Calyx not accrescent in fruit deeply cleft; lobes caudate ... ... 2. C. Phlomidis.

Calyx much enlarged in fruit, red within	....	3.	C. infortunatum.
Leaves in whorls of 3. Flowers blue	... ...	4.	C. serratum.

1. C. inerme, Gærtn. Fruct. 1. 271, t. 57, fig. 1; Fl. Br. I. 4, 589; Dalz. & Gibs. Bomb. Fl. 200; Bedd. Fl. Sylv. For. Man. 174; Brandis For. Fl. 363; Cooke Fl. Pres. Bomb. 2, 431; Trimen Fl. Ceyl. 3, 359.

A littoral, straggling, sometimes scandent shrub; branchlets glabrous. Leaves small, ovate, ·75″-2″ by ·5″-1″, obtuse at the apex, acute at the base, thick, glabrous, gland-dotted beneath; lateral-nerves about 4 pairs somewhat obscure; petioles ·25″-4″ long. Flowers white, in axillary, usually 3-flowered, pedunculate cymes: peduncles slender, ·5″-1·5″ long; bracts minute, linear. Calyx ·2″ long, glabrous; lobes triangular, acute. Corolla white with a tinge of pink, 1·25″ long; tube very slender about 1″ long, glabrous outside, hairy within, slightly split at the back; lobes subequal about ·3″ long, oblong, obtuse or subacute, spreading or reflexed with slightly crenulate margins. Filaments hairy, long-exserted. Ovary glabrous; style long-exserted; stigma acutely 2-lobed. Drupe pyriform, ·75″ long, obtuse, smooth, brown, seated on the enlarged calyx, splitting into 4, woody pyrenes.

Tropical sea-coasts of India and Ceylon, Australia, China, quite near the sea; common in the Konkan and N. Kanara, often planted in hedges. Flowers throughout the year, abundantly so during the R. S. The thick, succulent leaves have a peculiar fœtid odour when bruised; they are sometimes used as a febrifuge.

2. C. Phlomidis, Linn. f. Suppl. Pl. 292; Cooke Fl. Pres. Bomb. 2, 431; *C. phlomoides*, Willd, Sp. Pl. 3, 386; Fl. Br. I. 4, 590; Talb. Trees Bomb. 272; Bedd. For. Man. 174; Brandis For. Fl. 363. *Iran, airanamula*, M. *Arni,* Guz.

A large shrub sometimes a small tree; branches grey-pubescent. Leaves ovate, rhomboid, 1·5″-2·5″ by 1·25″-1·25″, obtuse or acute at the apex, subcordate or truncate at the base, undulate, coarsely crenate-serrate, grey-pubescent on both sides; petioles ·25″-·75″ long, densely grey-tomentose. Flowers fragrant, in small, axillary, dichotomous cymes forming a rounded, terminal panicle; bracts small, ovate obtuse, leafy. Calyx ·4″ long, divided half-way down; lobes ovate, acute or acuminate, glabrous, veined. Corolla white or pinkish, glabrous within, slightly pubescent outside; tube ·75″-1″ long; lobes ovate, subequal, ·3″ long, obtuse. Drupe pyriform, ·4″ long, normally deeply 4-lobed at the top, black, glabrous or slightly pubescent; each lobe with 1 pyrene.

Dry tropical and desert regions of India from the N. W. Himalaya to Ceylon; common in the dry districts of the presidency, often in hedges. Fl. Aug.-Feb. or nearly throughout the year. Usually a large, bushy shrub. The roots are used as a bitter tonic.

3. C. infortunatum, Gærtn. Fruct. 1, 271. t. 57, fig. 1; Fl. Br. I. 4, 594; Bedd. Fl. Sylv. 174; Brandis For. Fl. 363; Dalz. & Gibs. Bomb. Fl. 200; Cooke Fl. Pres. Bomb. 2, 432. *Bhandira, bhat, kahi,* Vern.

Usually a small shrub, often gregarious; branches quadrangular, fulvous-pubescent. Leaves broadly ovate, 4″-10″ by 3·5″-8″, shortly acuminate at the apex, cordate at the base, sharply serrate or entire, sparsely pubescent above, more or less pubescent or tomentose beneath; lateral-nerves about 5 pairs, lower 2 pairs, basal, strong beneath; venation reticulate; petioles 1·5″-5″ long, pubescent. Flowers white, tinged with red, rather large, long-pedicelled, in large, terminal, peduncled, pubescent, panicled cymes; bracts leafy, caducous. Calyx suborbicular, ·5″ long, much enlarged in fruit, deeply divided into 5, broadly lanceolate-acute, pubescent lobes. Corolla pubescent outside; tube slender about 1″ long; lobes oblong-obtuse, ·3″ long. Drupe subglobose, ·5″ in diameter, fleshy, purplish-black shining, seated in the centre of the much enlarged, red calyx; pyrene usually 1, brittle.

In waste places throughout tropical India and Burmah; throughout the presidency in monsoon-forest, very common in N. Kanara from the coast inland. Fl. Dec.-Apl. Fr. R. S.

"The leaves have a smoky odour when bruised and are used as an anthelmintic in Ceylon" Trimen.

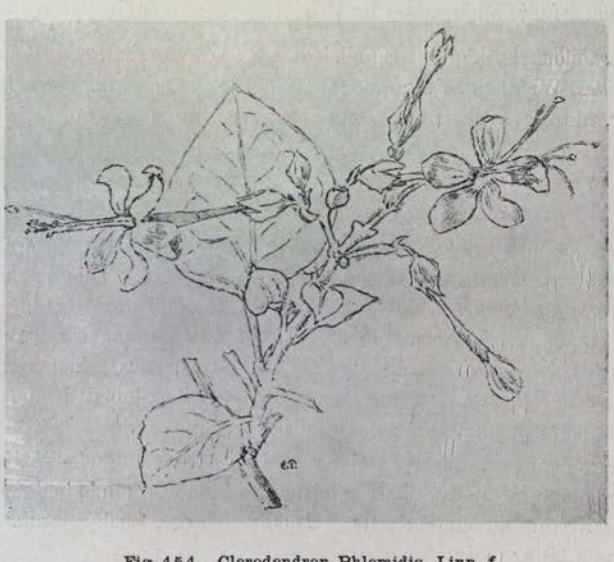

Fig 454. Clerodendron Phlomidis, Linn. f.

4. C. serratum, Spreng. Syst. 2, 758; Fl. Br. I. 4, 592; Dalz. & Gibs. Bomb. Fl. 200; Brandis For. Fl. 364; Cooke Fl. Pres. Bomb. 2, 432; Trimen Fl. Ceyl. 3, 360. *Bhârang,* Vern.

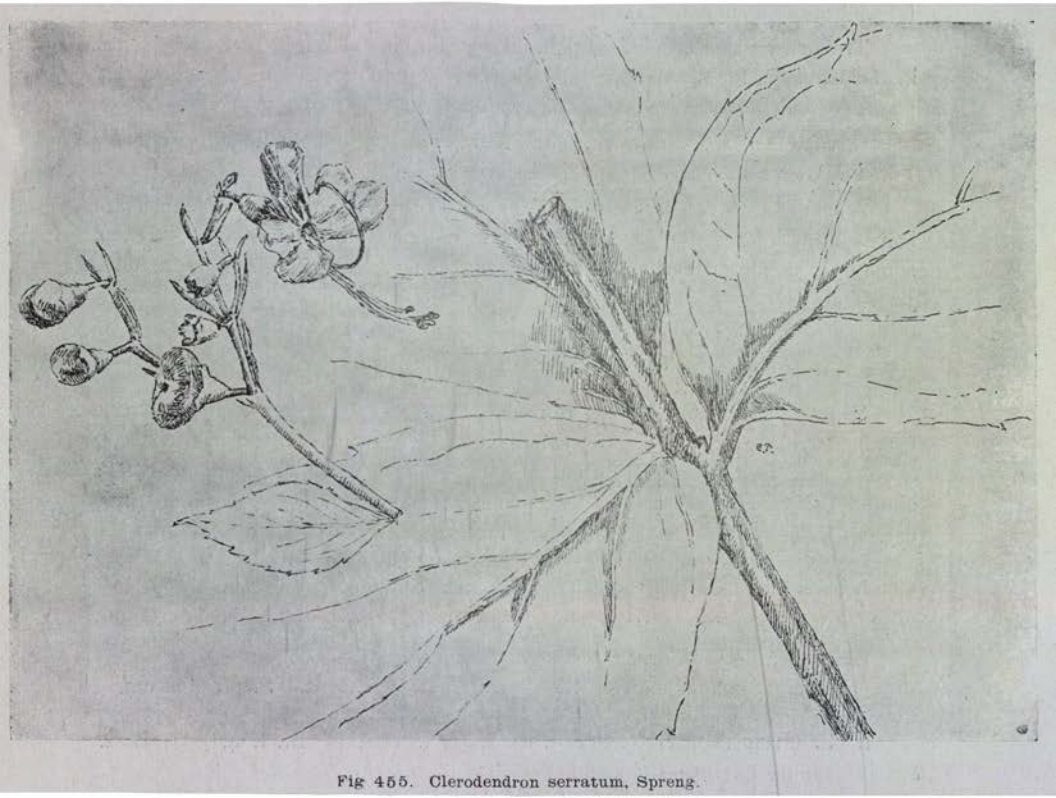

Fig 455. Clerodendron serratum, Spreng.

A small shrub with herbaceous, quadrangular, glabrous branches. Leaves large, ovate or oblong, usually ternately whorled, sometimes opposite (passing into bracts above), 4″-6″ by 2″-2·5″, acute at the apex and base, often much larger, coarsely and sharply serrate, glabrous, pale beneath; lateral-nerves 6 pairs, prominent beneath; petioles short, 0-·25″ long. Flowers large on stout deflexed, compressed pedicels, in lax, pubescent, dichotomous cymes forming a long, terminal, erect, pyramidal, leafy-bracteate panicle 6″-10″ long; bracts obovate to lanceolate, ·5″-1·5″ long, pubescent. Calyx cup-shaped, ·2″ long, puberulous; lobes short, broadly triangular, ciliolate. Corolla pale-blue; tube about ·25″ long, inflated and oblique at the mouth; lower lobe largest, oblong, deflexed, hooded, appearing as the upper on account of the twisted pedicels;

lateral and upper lobes ovate, spreading about ·5″ long. Stamens with strongly curved filaments, hairy at the base. Ovary and style glabrous. Drupe obovoid, ·25″ long, black, somewhat fleshy, normally 4-lobed with 1 pyrene in each lobe. (1-3 lobes often suppressed).

Tropical India, Burmah and the Malay peninsula; throughout the presidency in deciduous dry forests and open situations. Fl. Aug.-Oct. A handsome flowering plant, scarcely a woody species. The roots are used in native medicine.

C. Siphonanthus, Br. in Ait. Hort. Kew, ed. 4, 65; Fl. Br. I. 4, 595; Brandis For. Fl. 364; Dalz. & Gibs. Bomb. Fl. 200; Cooke Fl. Pres. Bomb. 2, 433.

A small shrub with very long tubular, white, ornamental flowers and lanceolate leaves often cultivated in gardens and near villages throughout the presidency, sometimes a garden escape. A native of Sikkim, Assam and Sumatra. Fl. June-Oct.

8. SYMPHOREMA, Roxb.

Scandent shrubs. Leaves opposite, entire or toothed. Flowers small, usually in 7-flowered, involucrate, capitate cymes; involucre of 6, obovate bracts, accrescent in fruit. Calyx 4-8-toothed. Corolla small, white. Stamens 6-16; anthers exserted. Ovary 2-4-celled; ovules 4; style filiform, shortly bifid. Fruit dry, 1-seeded. Seed erect; cotyledons fleshy.

Leaves thin. Corolla ·25″ long, 6-8-lobed. Stamens few ... ... 1. S. involucratum.

Leaves leathery. Corolla ·5″ long and longer, 12-16-lobed. Stamens many ... ... 2. S. polyandrum.

1. S. involucratum, Roxb. Cor. Pl. 2, 46, t. 186; Fl. Br. I. 4, 599; Dalz. & Gibs. Bomb. Fl. 199; Cooke Fl. Pres. Bomb. 2, 434.

A large climbing shrub; branches terete, buff or yellow-tomentose. Leaves ovate, 2″-3·5″ by 1″1·5″, shortly acuminate at the apex, rounded at the base, thin, nearly glabrous above with a few scattered stellate hairs, densely buff or yellow-tomentose beneath; lateral-nerves 3-4 pairs, strong beneath; petioles ·5″ long. Flowers white, crowded, about 7 together, in dense involucrate, peduncled, capitate cymes; peduncles slender, 1″-2″ long; bracts obovate, lanceolate, ·75″-1·5″ by ·25″-·5″, enlarged in fruit, sparsely stellate-hairy, thin, veined. Calyx ·2″ long, ribbed, tomentose; lobes ovate, subacute. Corolla ·25″ long, glabrous; lobes as long as the tube, obtuse. Stamens 6-8, as many as the corolla-lobes, inserted at the top of the corolla-tube, exserted. Ovary and style glabrous. Fruit subglobose, ·4″ in diameter, glabrous.

Western peninsula from the Konkan southwards to Ceylon, Nilgiris 4000'; throughout the Konkan and N. Kanara in monsoon-forest, common about Yellapore. Fl. Mch.-Apl. Fr. May-June.

" Bark thick, grey, corky, vertically deeply fissured. Wood white, soft and porous. Pores large, often subdivided in wedges between the few, moderately broad medullary rays" Gamble.

2. S. polyandrum, Wight Ic. t. 363; Fl. Br. I. 4, 599; Cooke Fl. Pres. Bomb. 2, 434;

A climbing or spreading shrub, branches and young parts tomentose. Leaves broadly ovate, 2"-6" by 1·5"-4·5", shortly acuminate at the apex, rounded at the base, irregularly crenate-serrate or dentate, thick, leathery, densely stellately-hairy on both sides, pale beneath; lateral-nerves 3-4 pairs not prominent; petioles ·5" long, tomentose. Flowers crowded in capitate, pedunculate, involucrate cymes; bracts obovate, obtuse, 1"-1·5" by ·3"-·5", tomentose. Calyx tubular-campanulate, ·3-·5" long, enlarged and urceolate-globose in fruit, white-tomentose; lobes short, ovate, obtuse. Corolla white, longer than the calyx; lobes 12-16, lanceolate acute, as long as the tube. Stamens as many as the corolla-lobes, exserted, glabrous. Ovary and style glabrous. Fruit subglobose, ·25" in diameter, enclosed in the white-tomentose, accrescent calyx.

Hills of the South Deccan peninsula northwards to Belgaum; Belgaum and Dharwar districts in dry open situations also in deciduous monsoon-forest; a somewhat rare species. Flowers profusely during Feb.-Mch. when it is bare of leaves. Fr. May. Bark grey, shining, lenticellate. Wood grey, soft.

9. AVICENNIA, LINN.

Gregarious littoral shrubs or small trees. Leaves opposite, coriaceous, entire. Flowers sessile, in peduncled heads, arranged in short, terminal, panicled, bracteate spikes; bracts and bracteoles small. Calyx deeply 4-partite, unaltered in fruit. Corolla short; tube cylindric; lobes 4, subequal. Stamens 4, inserted on the throat of the corolla-tube, included or exserted. Ovary imperfectly 4-celled by a 4-winged, central column; ovule 1 in each cell, pendulous between the wings; style long or short, shortly bifid. Capsule soft, compressed, ovate mucronate, 1-seeded; cotyledons very thick, fleshy, longitudinally folded; radicle inferior, villous.

A tree. Leaves obtuse. Stamens exserted. Style long	1.	A. officinalis.
A shrub. Leaves acute. Stamens included. Style short	2.	A. alba.

1. **A. officinalis,** Linn. Sp. Pl. 110; Fl. Br. I. 4, 604; Bedd. Fl. Sylv. 174; Brandis For. Fl. 371; Cooke Fl. Pres. Bomb. 2, 435; *A. tomentosa*, Jacq. Enum. Pl. Carib. 25; Grah. Cat. Bomb. Pl. 159. *White Mangrove Tree. Tivar*, M. *Ipati*,-K.

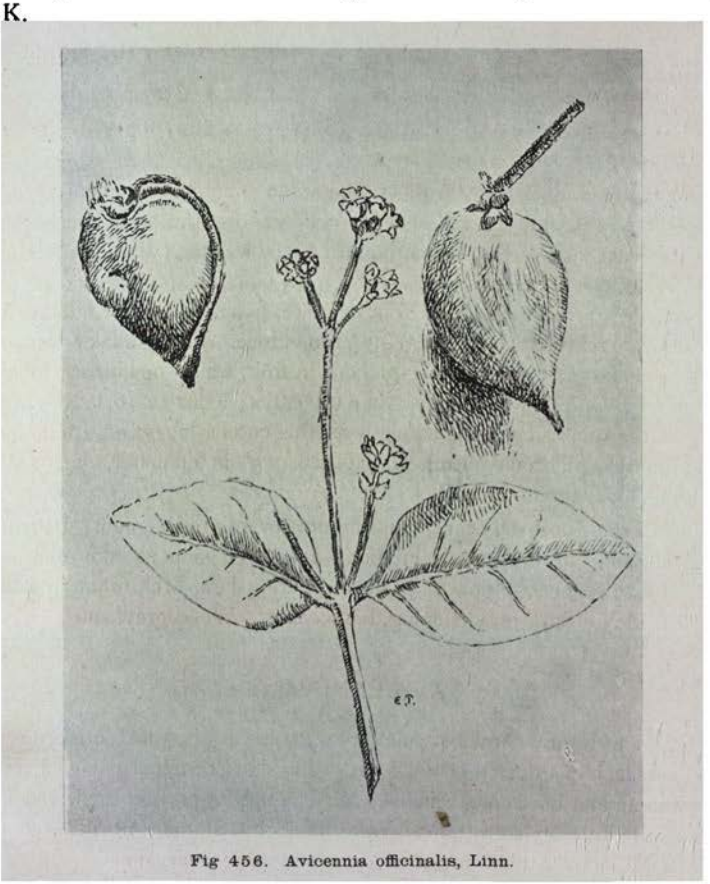

Fig 456. Avicennia officinalis, Linn.

A large evergreen shrub or small tree; branchlets quadrangular with fine, white silvery pubescence. Leaves ovate, or elliptic-oblong, 2″-3″ by 1″-1·5″, obtuse, rounded at the apex, acute at the base, coriaceous, glabrous above, white, thin, tomentose beneath; lateral-nerves about 6 pairs with reticulate venation between; petioles ·5″ long. Flowers yellow, sessile, in bracteate heads, arranged in terminal, trichotomous panicles; bract and 2 bracteoles ciliate, shorter than the calyx. Calyx-lobes or sepals ovate or suborbicular, ·15″ long, obtuse, concave, ciliate. Corolla-tube short; lobes 5, ovate acute, subequal. Stamens exserted;

anther-cells parallel. Ovary hairy, tapering into the style together about ·25" long; stigma shortly bifid. Capsule ovoid, 1"-1·5" long, compressed, beaked, grey-tomentose, wrinkled at the base, dehiscing into 2 thick valves; seed 1; cotyledons large, cordate and auriculate at the base, filling the fruit, often germinating on the tree; radicle villous with stiff hairs.

Coast tidal mangrove swamps of India, Burmah and the Andaman and Nicobar Islands; common throughout the Mangrove formation in the Konkan and N. Kanara. Fl. Mch.-June. Fr. ripe July-Aug. Roots furnished with pneumatophores. Bark greyish-brown, thin. Wood grey; heartwood dark-grey, hard, heavy and brittle composed of well-marked concentric layers consisting of a ring of white tissue which sometimes anastomoses with the ring of the next layer. The ring is lined with a row of medium-sized pores often containing a black substance. Fine pores surrounded with white tissue are equally distributed

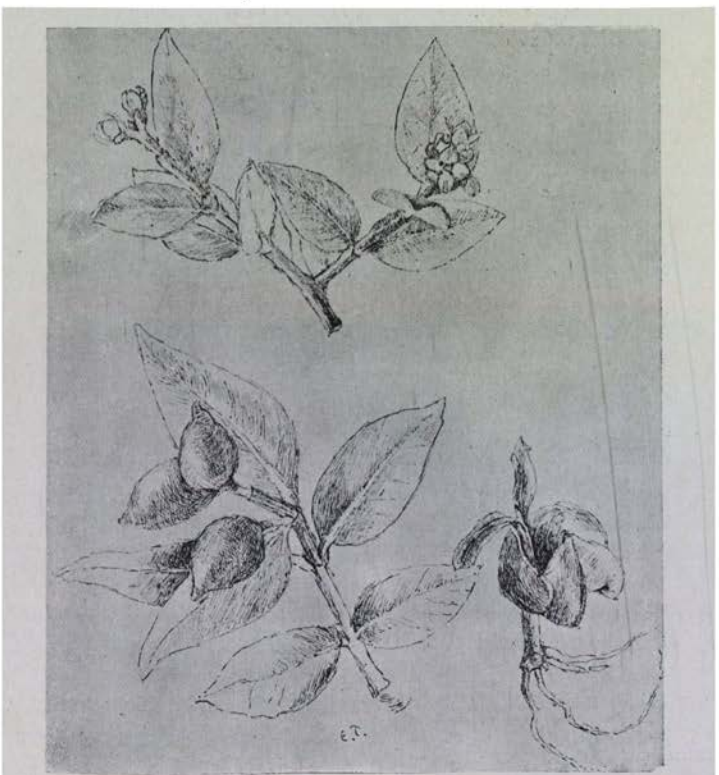

Fig 457. Avicennia alba, Blume.

throughout the layer. Medullary rays fine, white, uniform. Weighs 66 lbs. to the cub. ft. Used in India only for firewood. The bark contains tannin.

2. A. alba, Blume Bijdr. 821; Wight Ic. t. 1482; Prain Beng. Pl. 838; Cooke Fl. Pres. Bomb. 2, 436; *A. officinalis,* var. *alba,* Hook, f. Fl. Br. I. 4, 604. *Tivar,* M.

A shrub usually gregarious; branches grooved, angular, finely white-tomentose. Leaves ovate-lanceolate, 2″-3″ by ·75″-1″, acute at the apex and base, glabrous above, grey-tomentose beneath. Inflorescence as in the last species. Stamens included. Ovary and style villous. Capsules ovoid, flattened, ·5″-·75″ long, smooth, yellow when ripe. Closely allied to *A. officinalis.*

India in tidal swamps, common throughout the Konkan; on the trap near the sea-shore at Bandra, Bombay. Fl. apparently throughout the year.

Order LXX—LABIATÆ.

Herbs, rarely shrubs, usually with aromatic oil-glands. Stems quadrangular Leaves opposite or whorled, exstipulate. Flowers zygomorphic. Calyx 4-5 cleft or 2-lipped. Corolla hypogynous, gamopetalous; limb 4-5-lobed or 2-lipped; lobes imbricate in bud. Stamens 4, didynamous, inserted on the corolla-tube; the 2 upper sometimes imperfect. Disk prominent. Ovary 4-lobed and celled; ovules erect, solitary in each cell; style simple, inserted between the lobes of the ovary; stigma usually 2-divided. Fruit of 4, small, 1-seeded nuts, enclosed in the calyx. Seeds small, erect; albumen scanty or O; radicle inferior.

Calyx very deeply 5-cleft; lobes elongated and feathery in fruit	1.	Colebrookia.
Calyx 5-toothed not enlarged in fruit	2.	Pogostemon.

1. COLEBROOKIA, Sm.

A large woolly shrub or small tree. Leaves opposite or in verticels of three. Flowers small, in densely flowered whorls, arranged in paniculate spikes; bracteoles connate. Calyx-tube short; lobes long, capillary, feathery, plumose. Corolla very small, white. Stamens 4, very short, equal, distant, included. Disk uniform. Ovary 4-partite; style 2-fid. Nutlets obovoid, hairy at the tips; basal-scar small.

C. oppositifolia, Smith Ex. Bot. 2, t. 111; Fl. Br. I. 4, 642; Cooke Fl. Pres. Bomb. 2, 459; Gamble Ind. Timb. 547; *C. ternifolia*, Roxb. Cor. Pl. 3, 40. t. 245; Dalz. & Gibs. Bomb. Fl. 209. *Dussarica, bhamini,* Vern. *Tuggi-gidda, falia*, K.

A bushy shrub, often a small much-branched tree; branches obtusely quadrangular, grey or white-tomentose. Leaves ovate-lanceolate, 4″-9″ by 2″-4″, acute or acuminate at the apex, acute at the base, crenate-serrate, more or less softly pubescent above, densely so beneath; lateral-nerves 10-15 pairs, prominent beneath; petioles ·5″-1″ long. Flowers often polygamous, in panicled spikes 2″-4″ long by ·15″ in diameter, ultimately ·5″ in diameter, when they resemble as described by Graham tails of the small Indian Palm squirrel; bracts numerous, linear, hairy. Calyx-lobes subulate, ·1″ long in flower, ·25″ long in fruit, plumose. Corolla white, minute; tube with 4 short lobes, upper-lobe emarginate. Nutlet usually solitary, obovoid, hairy at the tip.

Sub-tropical Himalaya up to 4000′, Central India, Western peninsula; throughout monsoon-forest and along the borders of rain-forest in the Konkan

and N. Kanara, a very common species. Fl. Dec.-Feb. Fr. Mch.-Apl.

Stems deeply channelled. Bark grey, corky. Wood grey or whitish, soft. Pores small, few, equally distributed. Medullary rays fine or moderately broad, prominent. Weighs about 36 lbs. to the cub. ft. Used for gunpowder charcoal.

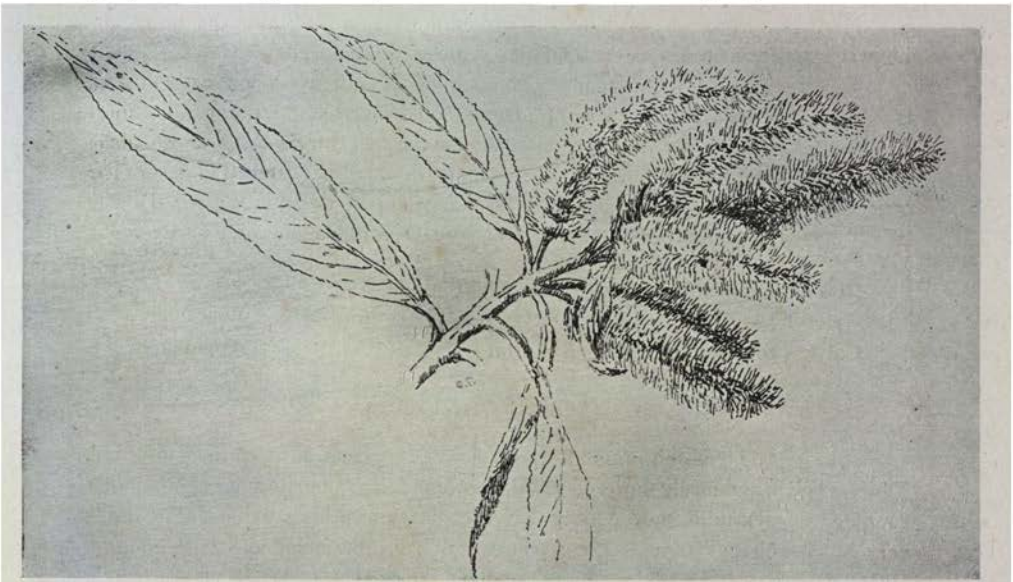

Fig 458. Colebrookia oppositifolia, Smith.

2. POGOSTEMON, DESF.

Herbs or undershrubs. Leaves usually opposite. Flowers small, bracteate, in dense, subcapitate whorls, arranged in axillary or terminal, dense-flowered panicles or spikes. Calyx subequally, 5-toothed. Corolla 2-lipped, 4-lobed, exserted. Stamens 4, exserted, often bearded; anther-cells confluent. Disk subentire. Style bifid. Nutlets ellipsoid, smooth.

P. parviflorus, Benth. in Wall. Pl. As. Rar. 1, 31; Fl. Br. I. 4, 432; Cooke Fl. Pres. Bomb. 2, 453; *P. purpuricaulis,* Dalz. in Kew Jour. Bot. 2, 336; Dalz. & Gibs. Bomb. Fl. 207. *Pangli,* M.

A stout much-branched, bushy shrub; branches obtusely quadrangular, purple, usually smooth and shining. Leaves with a strong odour of black currants when bruised, broad ovate, 3″-7″ by 1·5″-3·5″, acute or acuminate at the apex, cuneate at the base, irregularly and coarsely double toothed or crenate, glabrous or slightly

pubescent; petioles ·5″-2″ long. Flowers in unilateral spikes arranged in large pyramidal panicles; bracts pubescent, ciliate; outer ·25″ long, foliaceous; inner membranous, linear-lanceolate. Calyx small, glandular-pubescent. Corolla 2-lipped; tube about ·12″ long; upper-lip white, shot with purple, 3-lobed; middle-lobe oblong, longer than the lateral; lower-lip entire. Stamens ·5″ long, purple, hairy; anthers white. Nutlets ellipsoid, smooth shining; inner face angular.

Deccan ghàts up to 4500′, very common at Igatpuri, Khandala, Mahableshwar etc. growing in open situations and sometimes gregarious. Fl. C. S. and at other times throughout the year. A conspicuous and characteristic shrub of the moist ghát zone. The roots are used in the Ratnagiri district as an antidote for the poison of *Echis carinata,* a common snake in that district.

Several species of *Ocimum*, *Orthosiphon* and *Plectranthus* are common under-shrubs in many of the presidency forests.

Order LXXI.—NYCTAGINACEÆ.

Herbs shrubs or trees. Leaves usually opposite, simple, entire, exstipulate. Inflorescence various; flowers often bracteate-involucrate or bracts small, deciduous. Perianth petaloid, gamopetalous; tube persistent; limb 3-5-lobed, plaited in bud. Stamens hypogynous, 4-5, rarely more, (up to 20) sometimes unilateral; filaments unequal, inflexed in bud. Ovary free, more or less oblique; ovule solitary, basal, erect; style filiform; stigma small, simple or multifid. Fruit membranous, indehiscent, enclosed in the perianth-tube. Seed erect; albumen floury or soft; embryo curved, folded or convolute; radicle inferior.

PISONIA, LINN.

Trees or shrubs, sometimes armed with axillary spines. Leaves entire, opposite or alternate, exstipulate. Flowers in minutely bracteate, corymbose cymes, usually dicœcious. Perianth 5-10-lobed, of the male flower funnel-shaped of the female tubular. Stamens 6-10, exserted. Ovary sessile, oblique; stigma capitate or feathery. Fruit clavate or cylindrical; cotyledons crumpled, enclosing a scanty, soft albumen; embryo straight.

P. aculeata, Linn. Sp. Pl. 1026; Fl. Br. I. 4, 711; Grah. Cat. Bomb. Pl. 167; Cooke Fl. Pres. Bomb. 2, 482; Trimen Fl. Ceyl. 3, 381.

A large, straggling or climbing shrub, armed with nearly opposite, sharp, strong, curved spines; branches terete, subopposite, slightly pubescent or glabrous. Leaves ovate, 1″-3″ by ·5″-1·5″, obtuse at the apex, tapering at the base, quite glabrous; petioles ·25″-·75″ long. Flowers shortly pedicelled, in small, cymose, pubescent, rounded clusters, forming small, pedunculate, axillary panicles; bracts minute, hairy; pedicels short, elongated in fruit. Perianth campanulate in the male, tubular in the female flower, ·1″ long, pubescent outside; lobes acute, spreading. Stamens 6-10, much exserted. Style stout; stigma lacerate. Fruit oblong or clavate, long-pedicelled, 5-ribbed, pubescent between the ribs; each rib muricate with one or two vertical rows of viscous glands.

Coast forests of Burmah, the Andamans, Ceylon and Western peninsula, rare in the Bombay presidency, in rain-forest near Bunwasi, N. Kanara district. Fl. Jan.-Mch. Fr. Apl.-May.

Stems 6″ in diameter. Bark smooth, grey. "Wood light-brown of peculiar structure. Pores regularly arranged, very large, single or subdivided, in crescent-shaped groups with 2-3 moderate-sized pores radially arranged on the inside of each. Medullary rays very fine and numerous; they often pass through and subdivide the pores" Gamble.

Order LXXII.—POLYGONACEÆ.

Herbs, rarely shrubs. Leaves usually alternate; stipules scarious, sheathing. Flowers small, usually bisexual, jointed on the pedicels. Perianth of 3-6, free or connate, persistent sepals, imbricate in bud. Stamens usually 5-8, opposite the sepals. Disk annular, glandular or not. Ovary free, 1-celled, 2-4-angled; ovule solitary, basal; styles 1-3. Fruit a hard nut, enclosed in the calyx. Seed erect; testa membranous; albumen copious, floury or hard and horny, sometimes ruminate; embryo lateral, straight or curved, sometimes peripheric; radicle superior.

Stamens 12-18. Styles 4	1.	Calligonum.
Stamens 8. Styles 3	2.	Pteropyrum.

1. CALLIGONUM, LINN.

Rigid much-branched shrubs. Leaves alternate, linear or subulate, sometimes obsolete; sheathing stipule short. Flowers bisexual, solitary or few, ocreate. Sepals 5, flat. Stamens 12-18. Ovary free, 2-4-angled; angles crested or winged, echinate or setose; ovule solitary, orthotropous; styles 1-3; stigmas capitate. Fruit a 4-winged or biconvex nut, enclosed in the perianth. Seed oblong, terete or 4-angled; embryo central, straight.

C. polygonoides, Linn. Sp. Pl. 530; Fl. Br. I. 5, 22; Brandis For. Fl. 372; Cooke Fl. Pres. Bomb. 2, 510. *Phok, phog,* Sind.

A nearly leafless shrub; branches grey, glabrous; branchlets green, mostly fascicled, terete. Leaves few, linear-subulate. Flowers small, sweetly-scented, pink, 2-5-fascicled in the axils of the ocreate stipules. Perianth ·12″ long, pink, deciduous, deeply divided into 5, membranous, obovate, cuneate segments. Stamens with filaments dilated and pubescent at the base. Ovary tubercled; styles 4, slightly connate at the base; stigmas capitate. Nuts oblong, about ·3″ long, densely clothed with branched reddish-brown setæ which are dilated at the base, forming irregularly shaped crests.

Common locally in the dry arid parts of Sind, Punjab, Rajputana, Bikanir desert, N. E. Afghanistan, Persia, Arabia, Algeria, Syria and Egypt. Fl. in May after the young shoots appear. Fr. ripe June. Bark reddish-grey, rough with long, shallow furrows. Wood reddish-brown, very hard; chiefly used for fuel. In the Bikanir desert the twigs and branches are employed in the construction of walls

and roofs of huts. The abortive flowers which fall in great quantities during May are collected dried and made into bread in the South Punjab and sometimes in Sind.

2. PTEROPYRUM, JAUB. & SPACH.

A rigid, much-branched shrub. Leaves small, alternate or fascicled, linear or spathulate; sheathing stipules short or O. Flowers small, bisexual, ocreate. Perianth 5-partite; lobes subequal. Stamens 8; filaments filiform, pilose at the base. Ovary 3-angled; ovule solitary, orthotrope; styles 3; stigmas capitate. Nut broadly 3-winged, beaked. Seed with a broad base, beaked; embryo excentric; cotyledons oblong, short.

P. Oliveri, Jaub. & Spach. III. Pl. Orient. 2, 9, t. 108; Fl. Br. I. 5, 23; Cooke Fl. Pres. Bomb. 2, 511; Gamble Ind. Timb. 552.

A much-branched shrub with glabrous, white branches. Leaves fascicled, spathulate, oblong or linear, ·25″-·75″ long, glaucous, nerveless; petioles filiform, short; stipules membranous, produced at one or both sides into a triangular appendage. Flowers small, in many-flowered clusters; pedicels filiform, articulated about the middle. Perianth pink not much enlarged in fruit; lobes 5, the inner erect and appressed to the nut. Nut 3-winged but twisted and apparently with 6 broad wings in two tiers those of the lower tier largest.

Afghanistan, Persia and Sind; throughout the desert region. Fl. Sept.-Oct.

Order LXXIII.—ARISTOLOCHIACEÆ.

Herbs or shrubs sometimes climbing, often more or less fœtid. Leaves alternate, entire or 3-5-lobed, exstipulate. Flowers bisexual, often large, solitary, racemose or cymose. Perianth superior, regular or irregular, zygomorphic, tubular or 3-lobed; lobes valvate. Stamens 6 or more, subsessile in a ring round the base of the style; anther-cells parallel, opening by dorsal slits. Ovary inferior, 4-6-celled with parietal placentas; ovules numerous, style columnar; stigma lobed. Fruit capsular or baccate. Seeds numerous; albumen copious; embryo minute.

Erect shrubs. Perianth campanulate, equally 3-lobed.	1.	Bragantia.
Perennial twining or prostrate herbs. Perianth tubular, irregular, 2-lipped	2.	Aristolochia.

1. BRAGANTIA, LOUR.

Shrubs or undershrubs. Leaves entire, 3-5-basal-nerved. Flowers axillary, cymose, bracteate. Perianth shortly campanulate, equally 3-lobed. Stamens 6-12, 1-seriate, free or connate; connective thick. Ovary elongate, 4-celled; ovules numerous, 2-seriate, style short; stigmas divided into 3 or 6 (rarely more) linear lobes. Capsule elongate, 4-angled, 4-valved; valves separating from the central placentiferous column. Seeds oblong, 3-angled, rugose or pitted; albumen fleshy, abundant; embryo minute.

B. Wallichii, Br. in Wall. Cat. 7415; Fl. Br. I. 5, 73; Trimen Fl. Ceyl. 3, 421; Wight Ic. t. 520; Dalz. & Gibs. Bomb. Fl. 225; Cooke Fl. Pres. Bomb. 2, 523. *Chakrani,* M. *Mirsagni,* K.

An erect slender shrub; branchlets swollen at the nodes, finely pubescent. Leaves distichous, oblong-lanceolate, 5″-7″ by 1·5-″3″, acute or finely acuminate at the apex, acute at the base, entire, glabrous above, stellately pubescent and pale beneath, 3-nerved at the base; venation reticulate between the strong nerves; petioles very short and stout. Flowers in axillary, shortly pedunculate, irregularly umbellate, bracteate cymes; bracts small, linear; pedicels ·5″-1″ long, pubescent. Perianth tripartite, purple or greenish; lobes ovate, ·25″ long, concave, pubescent. Capsule linear, straight, torulose, 3″-4″ long, obtuse, 4-angled; seeds triangular, ·08″ long, acute at both ends and deeply pitted.

Western peninsula in ghàt rain-forest from the Konkan southwards, Ceylon; common near the Falls of Gairsoppah in N. Kanara. Fl. C. S. The foliage

resembles that of *Piper trichostachyon*. The root serves in native medicine as a preventative against cholera. Leaves slightly aromatic when bruised.

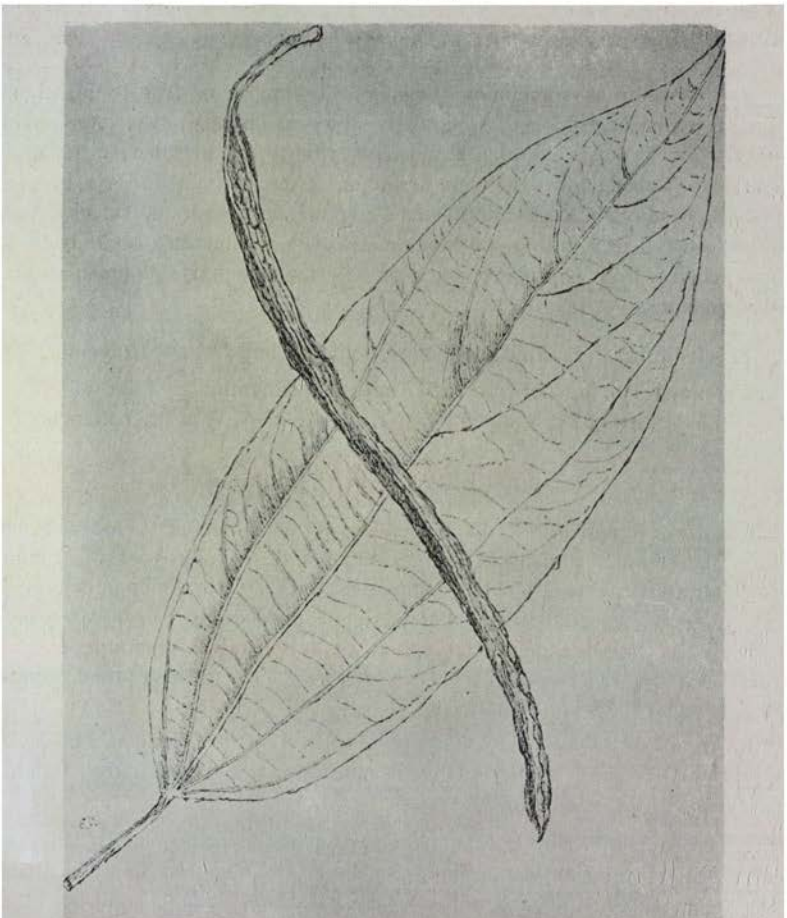

Fig 459. Bragantia Wallichii, Br.—*Fruit.*

B. Dalzellii. Hook. f. Fl. Br. I. 5, 523; Cooke Fl. Pres. Bomb. 2, 523.

A fine species with leaves 12″ by 3″ and torulose capsules, found in Dalzell's herbarium but without any habitat noted on the single specimen. It is impossible to say whether it is indigenous in the Bombay presidency or not.

2. ARISTOLOCHIA, Linn.

Perennial prostrate herbs or twining shrubs, sometimes fœtid. Leaves entire or lobed, usually cordate and basal-nerved; petioles dilated at the base, often with a stipule-like leaf in the axil. Flowers axillary. Perianth coloured, tubular; tube inflated at the base, obliquely 1-2-lipped; lip with recurved margins, pilose without. Stamens 6; anthers sessile in a circle round the style. Ovary inferior; ovules 2-seriate; style or column short, 3-6-lobed. Capsule septicidally 6-valved. Seeds triangular, often covered with the remains of the placenta.

Leaves reaching 4″ long, cuneate, rounded or shallowly cordate at the base. Racemes few-flowered ... 1. A. indica.

Leaves reaching 8″ long, deeply cordate at the base. Racemes many-flowered ... ... 2. A. Roxburghiana.

1. A. indica. Linn. Sp. Pl. 960; Fl. Br. I. 5, 75; Grah. Cat. Bomb. Pl. 178; Dalz. & Gibs. Bomb. Fl. 224; Cooke Fl. Pres. Bomb. 2, 524; Rheede Hort. Mal. 8, 25. *Sapshi, kadula, sampsun,* Vern.

A twining shrub with a woody base and slender glabrous branches. Leaves variable, linear-lanceolate to obovate-oblong, 1·5″-5″ by ·5″-3″, obtusely acuminate at the apex, cuneate, truncate or subcordate at the base, entire and somewhat undulate on the margins, glabrous; lower nerves basal; venation reticulate, distinct; petioles ·25″-·5″ long. Flowers bracteate, in few-flowered, axillary racemes; bracts small, ovate, acuminate; pedicels rather long, glabrous. Perianth greenish-white, 1·5″ long, globosely inflated at the base, suddenly bent at right angles; tube cylindrical with a trumpet-shaped mouth passing into a long, linear, obtuse, brown lip. Anthers 6. Style 6-lobed. Capsule oblong or globose, pendulous, 1·5″-2″ long, the valves remaining attached to the top; seeds deltoid-ovate, flat, winged.

Tropical India, Ceylon; throughout the presidency in moist monsoon or rain-forest, common along the Konkan and N. Kanara ghâts. Fl. Nov. Jan. "The leaves have a slightly aromatic scent and a faint bitter taste. The powdered root is a medicine of much repute in the treatment of children's bowel-complaints and also forms an ingredient in a cure for cobra bite." Trimen.

2. A. Roxburghiana, Klotzsch, in Monatsb. Berl. Akad. (1859) 596; Fl. Br. I. 5, 75; *A. acuminata,* Roxb. Fl. Ind. 3, 489; Dalz. & Gibs. Bomb. Fl. 284; Grah. Cat. Bomb. Pl. 178; *A. Tagala,* Cham. in Linnæa 207; Cooke Fl. Pres. Bomb. 2, 524.

A twining shrub with grooved, glabrous branches. Leaves broadly ovate, 4″-8·5″ by 2″-5″, acute or acuminate at the apex, deeply and narrowly cordate

at the base; lower leaves subsagittate, glabrous, pedately 5-7-nerved; petioles twining, 1″-2″ long. Flowers in lax, puberulous, racemose cymes, usually only 1 flower fertile; bracts small. Perianth greenish-yellow; tube curved; mouth oblique; lip straight, linear, obtuse, villous, as long as the tube. Capsule variable, globose, pyriform, 1″-1·5″ long; pedicels splitting into 6 filaments; seeds ovate-deltoid, ·25″-·5″ long with a broad, flattened, membranous wing, usually tubercled on one face.

E. Himalaya southwards to Penang, Bengal, Assam, Burmah, Western peninsula, Ceylon, Java and Borneo. A rare species in the Bombay presidency, noted by Dalzell from several localities in the Konkan also in rain-forest at Katgal, N. Kanara. Flowers C. S.

Order LXXIV.—PIPERACEÆ.

Aromatic herbs or shrubs often climbing. Leaves alternate, opposite or rarely whorled, often pellucid-dotted, entire, with or without stipules. Flowers minute, usually unisexual and dicœcious, in axillary or terminal, catkin-like spikes subtended by a peltate bract. Perianth O. Stamens 2-6, hypogynous; anthers jointed to the filaments; cells distinct or confluent. Ovary 1-celled; ovule solitary, erect; stigmas sessile. Fruit small, 1-seeded; testa thin; albumen copious; embryo minute.

PIPER, LINN.

Perennial herbs or shrubs, usually scandent by adventitious roots at the swollen nodes. Leaves entire, often unequal-sided, aromatic and gland-dotted; stipules various. Flowers minute, usually unisexual and dicœcious, each in the axil of a fleshy bract with or without 2 lateral bracteoles; bracts peltate or cupular sometimes decurrent on the spike-rachis with or without raised margins; bracteoles when present forming low ridges on the sides of the flower. Perianth O. Stamens 1-4; filaments short; anthers 2-celled; cells often confluent. Ovary 1-celled; ovule solitary, erect; style conic; stigmas 2-5. Fruit ovoid or globose with a thin testa and a hard albumen.

Climbing shrubs. Flowers dicœcious in simple spikes.
- Glabrous.
  - Male bract and bracteoles enlarged into a globose receptacle. Fruit yellow ... ... 1. P. trichostachyon.
  - Male bract adnate to the rachis with a winged membranous margin. Fruit red ... . 2. P. nigrum.
- Grey-hirsute.
  - Male bract peltate orbicular, somewhat decurrent ... ... 3. P. Hookeri.

Erect herbs with thick soft branches. Flowers bisexual in subumbellate spikes ... ... 4. P. subpeltatum.

1. P. trichostachyon, Cass. DC. in Prodr. 16, 1, 242; Fl. Br. I. 5, 80; Cooke Fl. Pres. Bomb. 2, 526; *Muldera trichostachys,* Miq. in Hook. Lond. Jour. Bot. 5, 556; Wight Ic. t. 1944.

A stout woody climber; branches glabrous, swollen at the nodes. Leaves ovate-lanceolate, 3″-5″ by 1″-2″, shortly, acutely acuminate at the apex, acute at

the base, coriaceous, glabrous, shining above, pale beneath; basal-nerves 3 with 2 opposite nerves a little higher up on the midrib, very strong beneath with conspicuous, reticulate venation; petioles ·25″-·5″ long. Flowers in lax, lateral, interrupted, hoary spikes, 2″-4″ long. Male flowers diandrous, on waxy-white, globose receptacles pubescent at the mouth. Stamens like 2 minute purple eyes on the top of the receptacle. Fruit globose, ·25″ in diameter, yellow, glabrous when ripe.

Deccan peninsula, Nilgiri and Shevagiri hills, common on the ghâts from Bombay southwards in rain-forest. Fl. and Fr. C. & H. S. A very distinct species.

2. P. nigrum, Linn. Sp. Pl. 28; Fl. Br. I. 5, 90; Wight Ic. t. 1935; Cooke Fl. Pres. Bomb. 526; Rheede Hort. Mal. 7, 23, t. 12. *Black Pepper. Kala-miri, mirvel,* Vern.

A stout, glabrous, climbing shrub much swollen at the nodes. Leaves broadly ovate, 4″-7″ by 2″-5″, acuminate at the apex, rounded or acute, sometimes unequal-sided at the base, coriaceous, glabrous, paler beneath; nerves 5-9, the 2 supra-basal nerves alternate; petioles ·5″-1″ long. Flowers usually bisexual, in slightly interrupted, slender, glabrous spikes; bracts oblong, concave, obtuse, forming a cup beneath the ovary; bracteoles united in a semilunar ridge above the ovary. Stamens 2. Stigmas 2-4. Fruit nearly globose, about ·2″ in diameter, yellow, turning red when ripe.

Doubtfully indigenous in the Bombay presidency, abundant in many of the N. Kanara rain-forests, probably an escape. Cultivated extensively in the N. Kanara Supari gardens. Fl. C. S. Furnishes the black and white peppers of commerce.

3. P. Hookeri, Miq. in Hook. Lond. Jour. Bot. 4, 437; Fl. Br. I. 5, 88; Dalz. & Gibs. Fl. Suppl. 315; Cooke Fl. Pres. Bomb. 527.

A climbing shrub; branches pubescent; branchlets grooved, terete, grey-hirsute. Leaves ovate or oblong-lanceolate, 2″-5″ by 1·5″-2·5″; acuminate at the apex, subcordate, equal or oblique at the base, thinly coriaceous, pellucid-punctate, glabrous above, pubescent beneath, 5-7 usually basal-nerved, 2 inner-nerves sometimes slightly supra-basal; petioles ·25″-·75″ long, hairy. Male flowers in slender spikes 3″-5″ long, spirally arranged round the rachis; bracts rounded, adnate and shortly decurrent on the rachis. Stamens 3. Stigmas 3-4, grey-tomentose, reflexed. Fruit globose.

Western peninsula on the ghâts from Bombay southwards to N. Kanara. in monsoon and rain-forest also on the Bababuden hills of Mysore. Fl. &. Fr. H. & R. S.

4. P. subpeltatum, Willd. Sp. Pl. 28; Fl. Br I. 5, 95; Cooke Fl. Pres. Bomb. 2, 527; *Pothomorphe subpeltata*, Miq. Syst. Pip. 213; Wight. Ic. t. 1925.

A large perennial, erect herb; stems thick, jointed, warted, otherwise glabrous, zigzag, and thickened at the nodes. Leaves orbicular, 8″-12″ in diameter, very shortly acuminate at the apex, cordate at the base, glabrous except on the nerves beneath, closely pellucid gland-dotted, palmately nerved; petioles 4″-8″ long, channelled in the lower part, amplexicaul at the base. Flowers hermaphrodite, in cylindrical, blunt, erect spikes, 2·5″-5″ long, subumbellately arranged in pairs; bracts small, stalked, succulent, with a thickened glabrous, triangular tip. Stamens 2. Stigmas 3. Fruit very small, obovoid, trigonous with a truncate top, brown.

Deccan peninsula from the Konkan southwards, Penang, Ceylon, the Malay peninsula and the tropics generally. Rare in the Bombay presidency in open situations in rain-forest near the Falls of Gairsoppah, N. Kanara district. Fl. & Fr. C. S.

Piper Betle, Linn. a native of Java which supplies the well-known *Pan* or *Betel-leaf* and *Piper longum,* Linn. *The Long Pepper*, a native of the hotter parts of India but not indigenous in the Bombay presidency are widely and universally cultivated species.

There is a climbing glabrous species with very small, globose fruit common in some of our N. Kanara rain-forests which has been doubtfully referred to *P. Wightii,* Miq.; it is closely allied to *P. sylvestre,* Lamk. which is included in Dalz. & Gibs. Bomb. Fl. The species of *Piper* (sec. *Eupiper*) are very difficult to correctly separate.

Order LXXV.—MYRISTICACEÆ.

Evergreen trees or shrubs. Leaves alternate, entire, sometimes pellucid gland-dotted. Flowers small, dicœcious, regular, fascicled, umbellate or panicled. Perianth gamophyllous, deciduous, usually 3-lobed; lobes valvate in bud. Male fl.: Stamens 3 or more, connate in a sessile or stipitate head, column, ring or disk; anthers 2-celled. Fem. fl.: Ovary superior, free, sessile, 1-celled; ovule 1, erect, basal; style short or O; stigma capitate, discoid or lobed. Fruit fleshy, opening in 2 valves. Seed more or less covered with a lobed or lacerate, often coloured arillus; testa usually thick; albumen hard, ruminate; embryo at the base of the seed very small; cotyledons divaricate, flat or crumpled; radicle short, inferior.

MYRISTICA, LINN.

The only genus with the same characters as the order.

Anthers elongate, connate, stipitate.
- Male flowers in branched, dichotomous, axillary cymes; peduncles slender ... ... 1. M. malabarica.
- Male flowers in short, densely flowered clusters on stout thick peduncles.
  - Leaves 6″-10″ long, dull-glaucous beneath ... 2. M. Beddomei.
  - Leaves 12″-24″ long, silvery beneath ... ... 3. M. magnifica.

Anthers on the toothed margin of a peltate, triangular disk ... ... 4. M. attenuata.

1. M. malabarica, Lamk. in Mem. Acad. Sc. Par. 162; Fl. Br. I. 5, 103; Dalz. & Gibs. Bomb. Fl. 4; Bedd. Fl. Sylv. t. 269; King Ann. Calc. Gard. 3, 288, t. 109; Cooke Fl. Pres. Bomb. 2, 530; Gamble Ind. Timb. 555. *Ran-jaiphul,* Vern.

A tallish tree of moderate dimensions; branchlets glabrescent. Leaves oblong or ovate-lanceolate, 4″-8″ by 1·5″-4″, subacute at the apex, acute at the base, thinly coriaceous, glabrous, dark-green, shining above, glaucous beneath; lateral-nerves about 10 pairs, somewhat obscure; petioles ·5″-·75″ long. Male fl. in slender-peduncled, rusty-pubescent, subumbellate cymes arranged in axillary or extra-axillary panicles 1″-2″ long; pedicels ·25″-·5″ long; bracteoles scale-like, appressed to one side of base of flower. Perianth ovoid, ·25″ long, rusty-puberulous,

3-lobed; lobes short, triangular, valvate. Anthers 10-14, connate on a short, rusty-tomentose column. Fem. fl. depressed-globose, larger than the male, in few-flowered, axillary umbels; bracteoles like in the male flowers. Perianth-teeth ovate. Ovary sessile, tomentose; stigma large, sessile, 2-lobed. Fruit elongate, 3″ long by 2″ in diameter, tapering from the base to the obtuse top, covered with deciduous, rusty tomentum; sutures distinct; arillus yellow, completely covering the seed which is slightly flattened on one side; peduncles thick, ·5″ long.

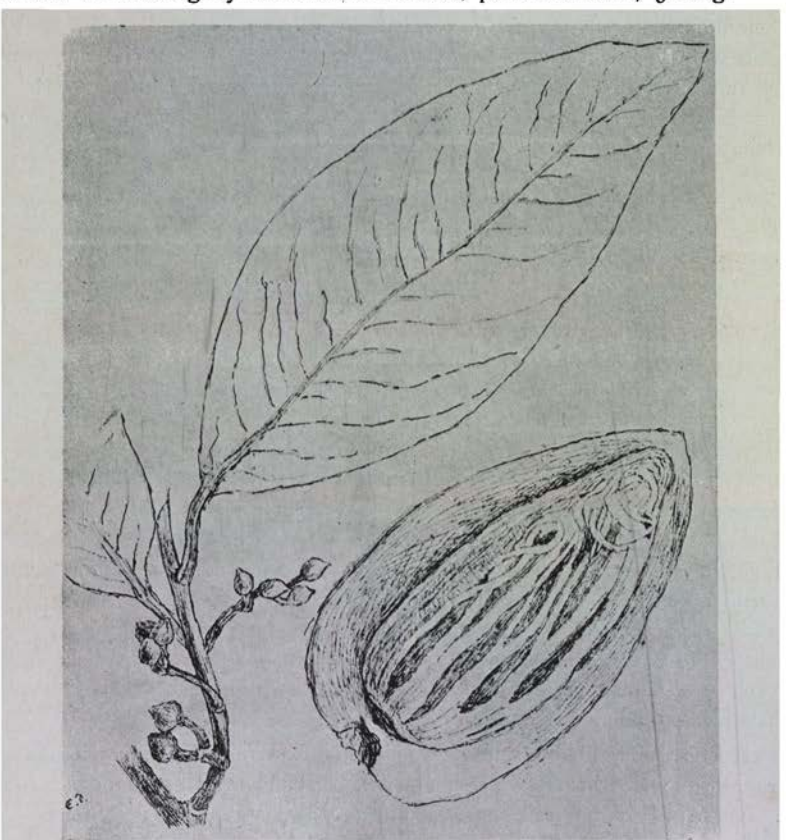

Fig 459. Myristica malabarica, Lamk.

Western peninsula from the Konkan to Malabar; rain-forests of the Konkan and North Kanara ghâts; common in the Kumpta taluka where it is gregarious in some of the kans. Fl. Nov.-Mch. Fr. C. & H. S. A tall tree, the stems seldom exceeding 2′ in diameter.

Bark smooth with little or no rhytidome, covered with small, lenticular dots; inner-bark with much red, watery juice. Wood reddish-grey, moderately hard, with narrow, concentric lines of light-coloured tissue like annual-rings. Pores medium-sized, oval, arranged in short, radial strings in echelon, not numerous. Medullary rays fine. Weighs about 39 lbs. to the cub. ft. The wood is said to be used for building purposes but is not in demand in N. Kanara where there are so many other timbers of superior quality conveniently available. The yellow-coloured mace known as *Ramputri* and the seed or nutmeg as *Ramphul* are both exported to Bombay. As both the mace and seeds are of very inferior quality they can only be used to adulterate the products of the true Nutmeg tree *(M. fragrans*, Houtt.) a native of the Moluccas. The seeds yield an oil used for burning and as an ointment.

2. M. Beddomei, King in Ann. Calc. Gard. 3, 291, t. 118; Gamble Ind. Timb. 556; Cooke Fl. Pres Bomb. 2, 530; *M. laurifolia,* Hook. f. & Thomp. Fl. Br. I. 5, 103; Talb. Trees Bomb. 280. *Ran-jayphal,* Vern. *Jajikai,* K.

A moderate-sized tree; branchlets glabrous. Leaves oblong or elliptic-lanceolate, 5″-9″ by 2·5″-4″, acute or obtuse at the apex, cuneate or rounded at the base, coriaceous, glabrous shining above, dull glaucous and rufous-pubescent on the nerves beneath; lateral-nerves 12-20 pairs, prominent beneath; petioles stout, ·5″-·75″ long. Male flowers in short, woody-peduncled, umbellate, 8-20-flowered, axillary cymes; bracteole suborbicular, rufous-tomentose, appressed to the perianth on one side; pedicels short or O. Perianth ovoid, ·2″ long, rufous-tomentose outside, glabrous within, 3-lobed; lobes shortly broad-triangular. Staminal-column cylindric, bluntly apiculate; anthers 9-10, linear. Female fl. sessile, in axillary, few-flowered cymes. Perianth globose-urceolate, rufous-tomentose outside. Ovary sessile, globose, pubescent; stigma sessile, subglobose, slightly oblique. Fruit solitary or in pairs, subglobose, about 2″ in diameter, minutely brown-pubescent with one sutural, longitudinal furrow; pericarp thick, succulent; peduncle ·25″ long, stout, woody; seed globose, 1·25″ in diameter; arillus red, extending to the top of the seed.

Western peninsula from the Konkan and N. Kanara to Travancore (0-5000′), in rain-forest; N. Kanara ghâts, common in the Kumpta and Siddapore talukas. Fl. Nov.-Mch. Fr. June-July.

A large or medium-sized evergreen tree. Bark smooth; inner-bark often with red juice. Wood reddish-grey, moderately hard, smooth, compact with narrow, distinct, white, concentric lines like annual-rings. Pores small, subdivided, in short, radial strings in echelon, scanty. Medullary rays very fine, wavy, uniform, closely packed, distinct. Weighs 52 lbs. to the cub. ft. A timber, likely to be useful in the match industry and which merits the attention of forest officers.

3. M. magnifica, Bedd. Fl. Sylv. t. 268; Fl. Br. I. 5, 104; Cooke Fl. Pres. Bomb. 2, 531; Gamble Ind. Timb. 556.

A large, buttressed, evergreen tree; trunk furnished with thick, aereal roots when young, like a mangrove on a large scale; branchlets covered with deciduous, mealy, rusty tomentum. Leaves elliptic or obovate-oblong, 12″-20″ by 4″-8″, acute at the apex and acute or rounded at the base, coriaceous, glabrous, shining above with rusty, deciduous tomentum when young, ultimately silvery-glaucous beneath; lateral-nerves 12-24 pairs, reddish-coloured and prominent beneath, looping within the margins; petioles short, stout, channelled. Male flowers in dense, axillary, 8-15-flowered clusters from stout, woody, short, axillary tubercles; buds ovoid, embraced at the base by the semiorbicular, sericeous bracteoles; pedicels short or O. Perianth ovoid-globose, ·2″ long; lobes 3-4, short, sharp, tomentose outside, glabrous within. Staminal-column bluntly apiculate, with a short, hairy stalk; anthers about 15, narrow, slightly unequal in length. Female flowers unknown. Fruit (from the Gairsoppah ghât) obovoid, 3″ long by 1·5″ thick, somewhat broader at the base than at the top, with a shallow, longitudinal, sutural groove, brown-pubescent; seed ellipsoid, about 2″ long, covered by an arillus laciniate from near the base and with the segments conduplicate at the apex.

South Travancore in the plains, N. Kanara near Mulamune on the Gairsoppah ghât in rain-forest. Very rare in the Bombay presidency, only noted from the one locality where there are a group of mature and young trees growing quite close to the ghât road. I have only been able to obtain fruiting specimens of this interesting species. The bark is smooth and contains like several other *Myristicas,* much red watery juice.

4. M. attenuata, Wall. Cat. 6791; Fl. Br. I. 5, 110; Bedd. Fl. Sylv. 176; King Ann. Calc. Bot. Gard. 3, 316; Cooke Fl. Pres. Bomb. 2, 531; Gamble, Ind. Timb. 557; *M. corticosa,* Bedd. Fl. Sylv. t. 27 (not of Hook. f. & Thomp. nor of Lour.); *M. amygdalina,* Grah. Cat. Bomb. Pl. 175 (not of Wall.); Dalz. & Gibs. Bomb. Fl. 4. *Rukt-mara, hedaggal,* K.

A tall evergreen tree with drooping or horizontal branches; branchlets rusty-tomentose. Leaves elliptic-lanceolate, 5″-9″ by 2″-3″, acute or acuminate at the apex, acute at the base, thinly coriaceous, densely tawny-tomentose when young, ultimately glabrous shining above, glaucous beneath; lateral-nerves about 15-20 pairs looping within the margins, reddish and prominent beneath; petioles ·5″ long. Male fl. ovoid, ·3″ in diameter, 3-6-fascicled on short, woody, axillary branches; pedicels ·5″-·3″ long, densely tawny-tomentose with a small bracteole beneath the flower or near the middle of the pedicel. Perianth deeply 3-lobed; lobes triangular-orbicular, red, woolly-tomentose outside, pink-tomentose inside. Staminal-column crowned with a triangular, purple disk on the edge of which are

inserted 12 sessile anthers. Female flowers bracteolate, tubular, ·25″ long, in short, peduncled umbels like the male but fewer flowered; pedicels very short or O. Perianth-tube as long as the lobes, circinately deciduous at the base. Ovary sessile, ovoid, densely black-hairy; stigma cup-shaped or hollow at the apex, split on one side; margins corrugated externally. Fruit ellipsoid, 1″-1·5″ pointed at both ends, densely red-tomentose; arillus fleshy, bright-red coloured, completely covering the seed.

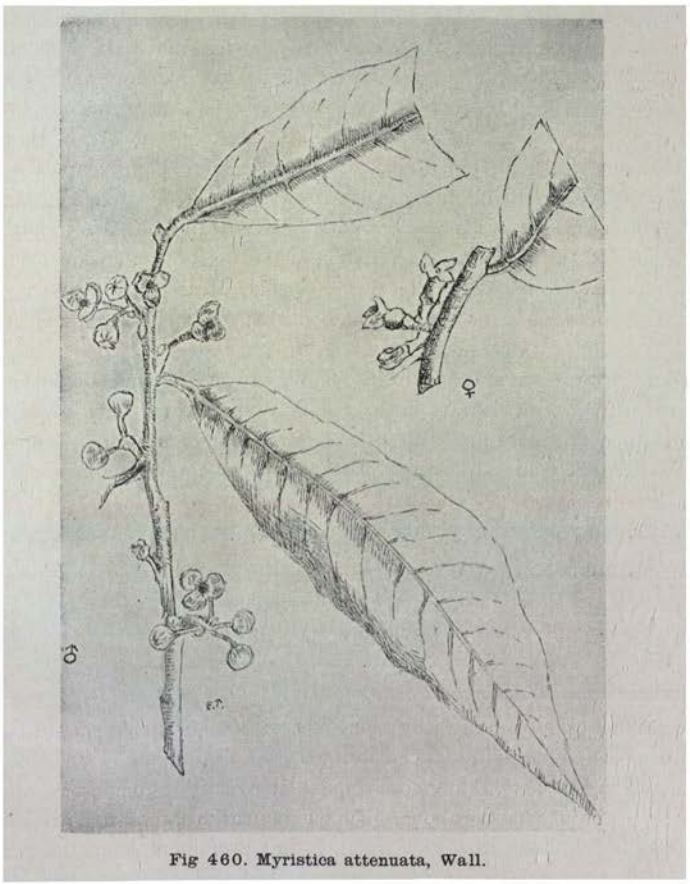

Fig 460. Myristica attenuata, Wall.

Western peninsula, apparently endemic; Travancore ghâts 2-3000′; very common in the Konkan and N. Kanara. Fl. Nov.-Jan. Fr. R. S. A tall tree in the middle tree-storey of the rain-forest. Bark ·25″ thick, scaling off in small patches and exposing the brown under surface; inner-bark with much blood-red,

watery juice; hence the Kanarese name *Rukt-mara* given to this tree. Wood reddish-brown, lustrous, light, smooth and soft. Pores moderately large, often subdivided or in small groups or lines of 2-3 together. Medullary rays fine, red, short, rather indistinct. Weighs 32 lbs. to the cub. ft. The timber is available in large quantities in N. Kanara and will no doubt eventually turn out useful for all purposes where a light, handsome, easily worked wood is essential.

Order LXXVI. LAURACEÆ

Aromatic trees or shrubs, except the leafless parasitic genus *Cassytha*. Leaves alternate or whorled, rarely opposite, usually evergreen, gland-dotted, exstipulate. Flowers regular, small, in axillary cymes, panicles or racemes, bisexual or unisexual, monœcious or often dicœcious; bracts deciduous or O, often involucrate. Perianth usually inferior, regular, 4-6-lobed; tube sometimes enlarged in fruit. Stamens normally 12, biseriate, usually half of the inner or outer stamens are wanting or reduced to staminodia; anthers erect, 2-4-celled; cells opening by upcurved, deciduous lids or valves. Ovary free, 1-celled; ovule solitary, pendulous; style terminal; stigma simple, discoid or dilated. Fruit a 1-seeded berry or drupe; peduncle often thickened; testa membranous; albumen scanty or O; cotyledons planoconvex, fleshy; radicle superior, minute.

Anthers 2-celled.
- Flowers bisexual.
  - Fruit wholly enclosed in the perianth-tube ... 1. Cryptocarya.
  - Fruit naked; perianth-tube deciduous ... ... 2. Beilschmiedia.

Anthers 4-celled.
- Flowers usually bisexual.
  - Perianth-tube only persistent in fruit .. ... 3. Cinnamomum.
  - Perianth-lobes reflexed in fruit ... ... 4. Machilus.
  - Perianth wholly deciduous ... ... 5. Alseodaphne.
- Flowers dicœcious.
  - Leaves subverticellate. Bracts membranous, densely imbricating, not whorled, deciduous... 6. Actinodaphne.
  - Leaves alternate. Bracts 4, leafy, involucriform 7. Litsea.

The woody indigenous species of this large and important Order are confined to and abundant throughout the rain-forest formation along the Western ghâts. The timbers of the more common species are mostly of good quality and merit the better attention of forest officers particularly in the N. Kanara district.

1. CRYPTOCARYA, Brown.

Evergreen trees or shrubs. Leaves alternate, usually penninerved. Flowers small, hermaphrodite, in axillary and terminal panicles. Perianth-tube turbinate, accrescent; lobes 6, concave, equal. Stamens 9 in 3 rows; 6 outer perfect with

introrse anthers; the 3 inner perfect with extrose anthers, alternating with 3 staminodes; anthers 2-celled. Ovary sessile, immersed in the tube of the perianth; style shortly exserted; stigma obtuse or discoid. Fruit wholly enclosed in the accrescent perianth-tube and sometimes adnate to it. Seed solitary, pendulous; testa membranous; embryo large; cotyledons plano-convex.

Leaves acuminate at the apex, glaucous beneath; lateral-nerves strong and prominent.
Panicles axillary, slender, fastigiate ... ... 1. C. Wightiana.

Leaves neither acuminate at the apex, nor glaucous beneath; lateral-nerves slender not prominent.
Panicles spreading, aggregated at the ends of the branches ... ... 2. C. procera.

1. C. Wightiana, Thw. Enum. 254; Fl. Br. I. 5, 120; Bedd. Fl. Sylv. t. 229; Cooke Fl. Pres. Bomb. 2, 533; Gamble Ind. Timb. 557; *C. floribunda*, Wight Ic. t. 1829; Dalz. & Gibs. Bomb. Fl. 222. *Gulmur.* K.

A large tree; branchlets angled, grooved and rusty-tomentose. Leaves ovate or elliptic-oblong, 4·5″-9″ by 2″-4″, shortly acuminate at the apex, rounded or subacute at the base, coriaceous, glabrous shining above, glaucous beneath; lateral-nerves 8-12 pairs, arcuate and strong beneath with conspicuous venation and more or less rusty-pubescent when young; petioles ·5″-·75″ long, stout, red-tomentose. Flowers small, yellowish in long or short, rather slender, axillary panicles; panicle-branches ·5″-2″ long; pedicels short, rusty-pubescent; bracts obovate, ·5″ long, very caducous; bracteoles minute, red-tomentose, caducous. Perianth ·15″ in diameter, divided to about the middle, tomentose outside; lobes obtuse or subacute, concave. Fruit globose or ovoid, ·5″ long, smooth, shining-black, crowned with the remains of the perianth-tube.

Western peninsula from the Konkan and N. Kanara southwards along the ghâts in rain-forest, Ceylon up to 5000′; common in the kans near Yellapore, N. Kanara district. Fl. Nov.-Jan. Fr. May-June. A very large tree. Bark thin with large open lenticels; inner-bark hard, reddish-mottled. Wood moderately hard and heavy, pale brownish-yellow, strong and durable. Pores moderate-sized, regularly distributed, thick and pale-walled. Medullary rays fine, regular. Used for building purposes, sugar-cane mills etc.

2. C. procera, sp. nov.

A very large tree; branchlets angled, glabrous. Leaves obovate or ovate-lanceolate, 4″-10″ by 2″-3·5″, acute or obtuse at the apex, acute and sometimes unequal-sided at the base; thinly coriaceous, glabrous, dark-green shining above, pale beneath but not glaucous; lateral-nerves 7-10 pairs, slender not prominent;

petioles glabrous, 1″-2″ long. Flowers in spreading, axillary panicles 4″-9″ long, aggregated at the ends of the branches; pedicels ·1″-·15″ long, grey-pubescent; bracteoles minute, caducous; buds globose or ovoid, grey-pubescent. Perianth divided to near the base; lobes ovate or ovate-lanceolate, ·3″ long, the 3 outer often shorter than the 3 inner, grey-pubescent on both sides. Stamens 9 perfect; filaments pubescent; staminodes short, tomentose. Ovary glabrous; style pubescent; stigma capitate. Fruit not seen.

A large tree, common in many of the rain-forests along the ghâts in N. Kanara. Fl. C. S. Distinct from *C. Wightiana,* Thw. with which it has hitherto been confounded; it comes near *C. amygdalina,* Nees, a species indigenous in the Andamans.

2. BEILSCHMIEDIA, NEES.

Evergreen trees or shrubs. Leaves alternate or opposite. Flowers small, bisexual, in short panicles or racemes in the axils of the upper leaves. Perianth deciduous; lobes nearly equal. Stamens arranged as in *Cryptocarya*; perfect stamens 9; anthers 2-celled; inner 3 stamens with extrorse anthers; outer 6 with introrse anthers; staminodes of the fourth series sessile or cordate. Ovary free from the perianth, narrowed into the style; stigma obtuse. Fruit an oblong or subglobose berry, shortly pedicellate.

B. fagifolia, Var. *Dalzellii,* Meissn. in DC. Prodr. 15, part 1, 64; Fl. Br. I. 5, 122; Cooke Fl. Pres. Bomb. 2, 534; Gamble Ind. Timb. 559; *B. fagifolia,* Bedd. Fl. Sylv. t. 263; *B. Roxburghiana,* Dalz. & Gibs. Bomb. Fl. 222. (not of Nees). *Kamatti,* K.

A large or very large tree; branchlets glabrous. Leaves ovate, 4″-5″ by 1·5″-2·25″, acute at the apex, acute or sometimes cuneate at the base, coriaceous, glabrous shining above, dull beneath; lateral-nerves 8-10 pairs, slender; petioles ·5″-·75″ long. Flowers in short, densely-flowered, axillary panicles, crowded at the ends of the branches; bracts ovate or orbicular, concave, densely pubescent outside, caducous. Perianth deeply divided into 6 lobes; lobes oblanceolate, ·12″ long, obtuse, pubescent on both sides. Filaments hairy. Ovary ovoid, hairy. Fruit ovoid or subglobose, 1·25″-1·5″ long, rounded at both ends, dark-blue with much powdery bloom; seed large with a crustaceous episperm; albumen scanty.

Western peninsula from the Konkan southwards to S. Kanara in rain-forest along the ghâts, common near the Ainshi ghât in N. Kanara. Fl. C. S. Fr. H. S. Usually a very large tree. Bark thin, grey, scaly; inner-bark yellowish, woody. Wood light-brown, smooth, shining and moderately hard. Pores medium-sized, simple or divided, equally distributed. Medullary rays fine, uniform, reddish. Weighs about 40 lbs. to the cub. ft. "A strong timber sometimes used for building

purposes in S. Kanara" Bedd. Merits the attention of forest officers in N. Kanara where there is a considerable quantity of material available in convenient localities.

Fig 462. Beilschmiedia fagifolia, Nees.

3. CINNAMOMUM, Blume.

Evergreen trees or shrubs. Leaves opposite or alternate, usually 3-nerved. Flowers small, bisexual or polygamous by abortion, in axillary or subterminal panicles. Female-fl. largest, sometimes with fewer parts. Perianth-tube short, cup-shaped; lobes 6, subequal, deciduous or persistent. Stamens arranged in 3 rows as in *Cryptocarya;* perfect stamens 9, 4-celled; 6 outer eglandular with introrse anthers; inner 3 each with 2 glands at the base and extrorse anthers; fourth series of 3 short staminodes. Ovary free, narrowed into the style; stigma

discoid or obscurely 3-lobed. Fruit a berry supported by the thickened receptacle and perianth. Seed with a thin testa.

C. zeylanicum, Blume Bijdr. 568; Fl. Br. I. 5, 131; Bedd. Fl. Sylv. t. 262; Cooke Fl. Pres. Bomb. 2, 535; Gamble Ind. Timb. 562; *C. aromaticum,* Grah. Cat. Bomb. Pl. 173; Dalz. & Gibs. Bomb. Fl. Suppl. 74; *C. iners,* Grah. Cat. Bomb. Pl. 173. *Dalchini, nisani, nisne,* K. *Ohez, bojevar,* Vern. *Wild Cinnamon Tree.*

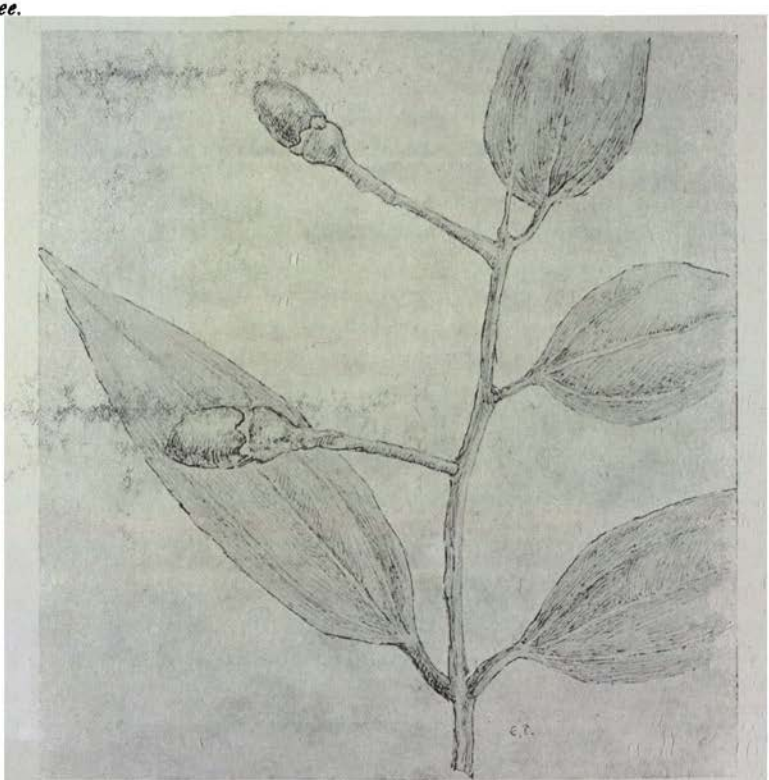

Fig 463. Cinnamomum zeylanicum, Breyn.

A medium-sized tree; branchlets compressed, grooved, glabrous. Leaves opposite or alternate, very aromatic when crushed, ovate-lanceolate, 3″-8″ by 1·5″-3″, subacute or shortly acuminate at the apex, subacute at the base, coriaceous, glabrous, dark-green above, pale beneath; nerves 3-5, sub-basal, strong beneath with fine, reticulate venation. Flowers in axillary, long-peduncled, lax panicles sometimes 2-3 together from the same axil, longer or shorter than the leaves; buds silky-pubescent; pedicels ·1″-·25″ long, pubescent; bracteoles about the

middle of the pedicels small, rounded, pubescent. Perianth ·25" long; lobes broad-ovate, obtuse or subacute. Fruit ovoid-oblong, ·5" long, minutely apiculate, dark-purple, smooth, seated on the much enlarged, rugose perianth-tube.

Tenasserim, Burmah, Malay peninsula and moist low country of Ceylon where it is extensively cultivated. Western peninsula in rain-forest along the ghâts from the Konkan southwards, up to 6000', very common in the N. Kanara district. Fl. Nov.-Feb. Fr. June-July. Bark ·25" thick, smooth, pale-coloured, rough in very old trees; inner-bark reddish; green-parenchyma developed. Wood grey, soft, light, porous and rough. Pores medium-sized, often subdivided, numerous, arranged in wavy lines. Medullary rays reddish, fine, equidistant. Weighs 36 lbs. to the cub. ft. The Cinnamon gardens of Ceylon along the South-West coast where the tree is treated under coppice are of considerable extent; the area under cultivation exceeding 40,000 acres and the value of the bark export trade being about 25 lakhs of rupees. In N. Kanara the right of collecting the bark is sold in the Kumpta, Siddapore and Sircy talukas to petty contractors. The total value of the produce does not however exceed 1000 rupees annually. Cinnamon spice is obtained from the inner-bark of the shoots and branchlets in the form of small rolled quills. The quality of the Kanara produce is not so good as that from the Ceylon plantations. The leaves are very aromatic when bruised and are used medicinally. The root-bark yields an excellent camphor. A medicinal oil is also obtained from the berries.

C. macrocarpum, Hook. f; Fl. Br. I. 5, 133; Cooke Fl. Pres. Bomb. 2, 535; *C. iners,* Wight Ic. t. 130; *Carua*, Hort. Mal. 1, t. 57

I am doubtful whether this is not merely a variety of *C. zeylanicum,* with a large fruit. The plate in Wight's Icones is copied from the Hortus Malabaricus which I take to be from Rheede's long description a representation of the common Western peninsular *C. zeylanicum.* There is no other species of *Cinnamomum* described in the Hortus Malabaricus. The material in the Kew herbarium relating to this species is according to Dr. Cooke very meagre.

4. MACHILUS, Nees.

Evergreen trees. Leaves alternate, penninerved. Flowers small, bisexual, in axillary panicles. Perianth 6-lobed, persistent and accrescent in fruit; tube short or obsolete; lobes subequal, reflexed in fruit. Perfect stamens 9 in 3 rows; anthers 4-celled; filaments of first and second rows eglandular with introrse anthers; filaments of third row each with 2 stipitate glands at the base and extrorse anthers; fourth row of 3 stipitate, cordate staminodes. Ovary sessile, narrowed into the style; stigma discoid. Fruit globose or ovoid seated on the persistent perianth.

M. macrantha, Nees in Wall. Pl. As. Rar. 2, 70; Fl. Br. I. 5, 140; Bedd. Fl. Sylv. t. 264; Dalz. & Gibs. Bomb. Fl. 221; Cooke Fl. Pres. Bomb. 2, 536; Gamble Ind. Timb. 567; *M. glaucescens,* Wight Ic. t. 1825 (excl. syn.); Dalz. & Gibs. Bomb. Fl. 221. *Gulum, gulmav.* K.

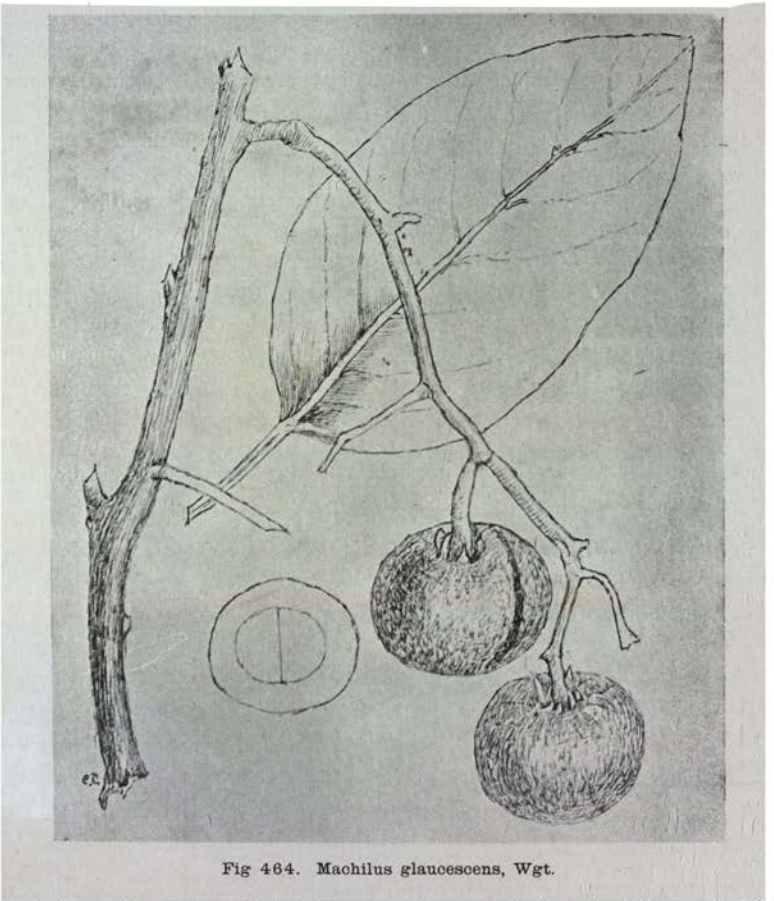

Fig 464. Machilus glaucescens, Wgt.

A large tree; branchlets glabrous. Leaves clustered at the ends of the branches, ovate-oblong or elliptic-lanceolate, 3·5″-5″ by 1·75″-2·5″, obtuse or subacute at the apex, acute and slightly unequal-sided at the base, coriaceous, glabrous shining above, pale beneath; lateral-nerves 6-10 pairs, slender; petioles ·75″-1·5″ long. Flowers yellowish, in long-peduncled, grey-pubescent panicles usually clustered near the ends of the branches, shorter or longer than the leaves; buds globose, ·1″ in diameter, densely softly grey-pubescent; pedicels stout,

0-·25″ long, pubescent; bracteoles linear acute at the base of and usually longer than the buds. Perianth ·25″ across; lobes ovate or oblong, subacute. Filaments hairy. Fruit depressed-globose, ·75″ in diameter, dark-green shining, dotted with white, very succulent; perianth-lobes at base of fruit deflexed, pubescent, about ·25″ long.

Western peninsula from the Konkan southwards up to 7000′; Ceylon in rain-forest 0-4000′; throughout the ghât-forests of the Konkan and N. Kanara, common near Yellapore. Fl. Nov.-Dec. Fr. Feb.-Mch. Bark grey, smooth. Wood grey, or light-reddish, soft, smooth, lustrous. Annual-rings indistinct. Pores moderate-sized, often subdivided. Medullary rays broad, short, reddish, distinct. Weighs 42 lbs. to the cub. ft.; suitable for planking, tea-boxes etc. Beddome states that the timber is often used for building purposes in the Madras presidency and Bourdillon that it serves for the construction of boats in Travancore.

It is quite possible that there are two distinct species of *Machilus* viz. *M. macrantha,* Nees and *M. glaucescens,* Wight in the forests of the Bombay presidency; the former has a small black fruit and the latter a large green, white-dotted one. The leaves of *M. macrantha* are smaller with a dull upper surface and not shining like in the common *M. glaucescens.* The fruits of the two plants appear exactly similar in dried specimens. *M. macrantha,* is common according to Dalzell on the Parwar ghât; it is rare in N. Kanara.

5. ALSEODAPHNE, Nees.

Evergreen trees. Leaves alternate, penninerved, subverticellate at the ends of the branches. Flowers hermaphrodite, in axillary, lax, cymose panicles. Perianth deciduous, divided nearly to the base into 6, subequal lobes; tube very short. Stamens 9 in 3 rows as in *Cinnamomum* etc.; staminodes of fourth row small, sagittate. Fruit ellipsoid, seated on the truncate end of the swollen and fleshy peduncle without any supporting perianth.

A. semicarpifolia, Nees in Wall. Pl. As. Rar. 2, 72; var. *angustifolia,* Meissn.; Fl. Br. I. 5, 144; Dalz. & Gibs. Bomb. Fl. 222; Bedd. Fl. Sylv. t. 297; Gamble Ind. Timb. 568; Cooke Fl. Pres. Bomb. 2, 536. *Neltare, mashe,* K. *Miri, phudgus.* M.

A medium-sized tree; branchlets subwhorled, glabrous. Leaves crowded at the ends of the branches, obovate or oblong-lanceolate, 3″-6″ by 2″-2·25″, obtuse or rounded at the apex, tapering at the base, coriaceous, glabrous shining above, thinly white-tomentose or nearly glaucous beneath; lateral-nerves 6-10 pairs, prominent beneath; petioles ·25″-·75″ long, pubescent. Flowers small, yellowish-green, in long, slender peduncled, lax panicles at the ends of the branches, longer

or shorter than the leaves; pedicels ·2″ long. Perianth-lobes sub-equal, ·15″ long, broadly ovate, subacute. Fruit ovoid-oblong, ·5″ long, rounded at the top; peduncles ·5″-1″ long, smooth, swollen at the top, glabrous.

Western peninsula from the Konkan southwards up to 5000′, Ceylon in dry-forest, Konkan and N. Kanara ghâts from the coast inland, usually in rain-forest. Fl. July-Sept. Fr. Apl.-May. Bark dark-coloured, smooth. Wood grey or brownish, smooth, hard and compact. Pores small, subdivided, enclosed in loose tissue. Medullary rays fine, uniform, distinct often sinuous where they are in contact with the pores. Weighs 48 lbs. to the cub. ft. An excellent, strong timber used for building purposes and in the construction of native boats in N. Kanara.

6. ACTINODAPHNE, Nees.

Evergreen trees. Leaves subverticellate, penni – or triple-nerved. Flowers dicœcious, in axillary, bracteate umbels or clusters; bracts membranous, imbricating, caducous. Perianth-tube short, enlarged in fruit; segments 6, usually deciduous. Stamens 6-9; anthers 4-celled, all introrse; outer 6 stamens eglandular; inner 3 each with 2 basal-glands. Staminodes of female 9. Ovary free; style thick, stigma dilated. Fruit globose, seated on the truncate or concave, enlarged perianth-tube. Seed with a thin testa.

A. Hookeri, Meissn. in DC. Prodr. 15, 1, 218; Fl. Br. I. 5, 149; Bedd. Fl. Sylv. t. 296; Cooke Fl. Pres. Bomb. 2, 537; Gamble Ind. Timb. 569; *A. lanceolata,* Dalz. & Gibs. Bomb. Fl. 312; *A. angustifolia,* Nees, in Wall. Pl. As. Rar. 3, 31; Wight Ic. t. 1841; *Tetranthera lancæfolia,* Grah. Cat. Bomb. Pl. 174, (not of Roxb). *Pisha,* M. *Tudgensu, haggodgi-mara,* K.

A moderate-sized or small tree; young parts densely silky rufous-pubescent. Leaves subverticellate at the ends of the branches, ovate-lanceolate, 4″-7″ by 1·5″-2·5″, finely acuminate at the apex, acute at the base, coriaceous, glabrous shining above and white or glaucous beneath; young leaves more or less red silky-pubescent; lateral-nerves 6-10 pairs, often branched near the middle, prominent beneath; petioles ·5″-1″ long. Male fl. golden-yellow, in small, short-peduncled, densely-flowered, shining rufous-haired clusters on the branches beneath the leaves; bracts cupular, imbricate, densely silky; pedicels articulate, densely rufous-hairy. Perianth-lobes ovate, acute, ·2″ long. Filaments hairy; anthers exserted; valves glabrous. Female fl. in few-flowered clusters or very short racemes below the leaves. Staminodes 9; glands of the interior row sessile. Style rather long; stigma capitate, oblique. Fruit globose, ·15″-·5″ in diameter, red when ripe, seated on the cup-shaped, enlarged perianth-tube.

Forests of Orissa and the E. coast, Western peninsula in rain-forest along the ghâts; very common at Mahablehswar and Matheran also throughout N.

Kanara. Fl. Oct.-Nov. Fr. Feb.-Mch. A medium-sized or small tree. Bark smooth, often with lenticular markings; inner-bark light-brown with fibrous, homogeneous tissue. Wood yellowish-grey, moderately hard, compact, smooth. Pores small often arranged in short, radial lines or in groups between the fine, wavy, distinct, closely set medullary rays.

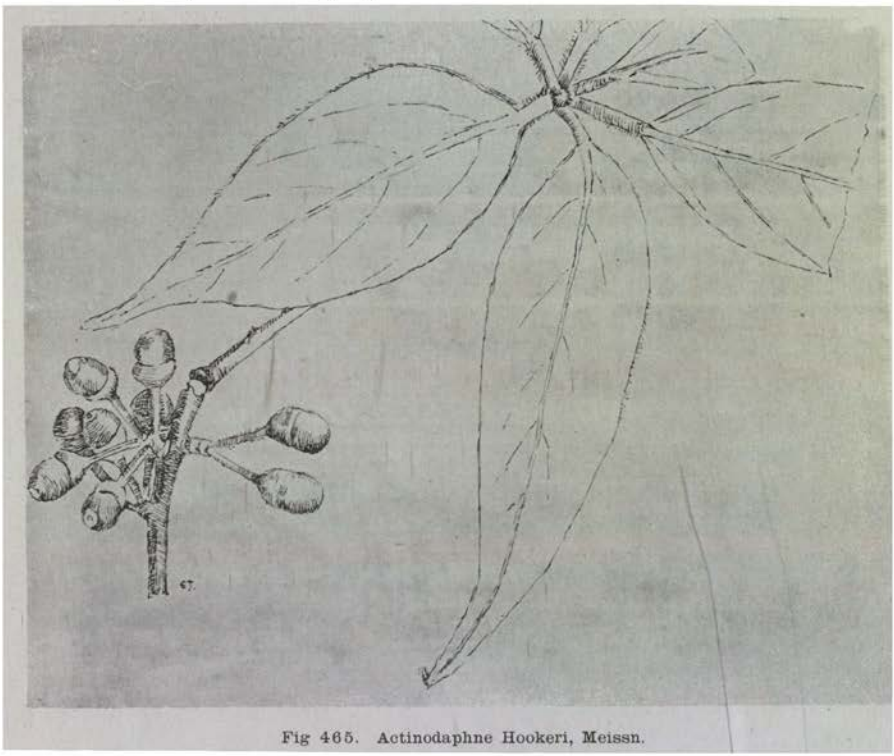

Fig 465. Actinodaphne Hookeri, Meissn.

Weighs about 45 lbs. to the cub. ft. The timber appears to be strong and of excellent quality; it is not as far as I know used in the N. Kanara district. The pendulous, reddish-hairy, verticellate leaves of this tree are conspicuous throughout the N. Kanara rain-forests. I have a variety from the Nilkund ghât with larger, obovate, shortly and not finely acuminate leaves and with much smaller olive-green fruit, which latter may however eventually turn light-red when ripe.

7. LITSEA, Lamk. (Tetranthera, Jacq.)

Usually evergreen trees or shrubs. Leaves alternate, penninerved or rarely tri-basal-nerved. Flowers small, dicœcious, umbellate; umbels few or many-

flowered, pedunculate, axillary or from the scars of fallen leaves; bracts 4-6, involucrate, imbricate, concave. Male fl.: Stamens 6-9-12, outer 6 usually eglandular; anthers introrse, 4-celled. Ovary minute. Fem. fl.: Staminodes 9-12 or in the 2-merous flowers 6. Ovary free or included in the perianth-tube; style short or long; stigma usually more or less irregularly lobed. Fruit a succulent drupe seated on the much enlarged perianth-tube which is 6-toothed or irregularly lobed.

Leaves penninerved.
Perianth-segments incomplete or O; tube scarcely accrescent in fruit. Stamens often more than 12.
Leaves tomentose beneath. Umbels solitary, many-flowered... ... ... 1. L. tomentosa.
Leaves glabrous beneath. Umbels corymbose or racemed, few-flowered ... ... 2. L. sebifera.
Perianth-segments 6; tube enlarged, cupular in fruit. Stamens about 12.
Leaves glaucous beneath. Filaments glabrous 3. L. Stocksii.
Leaves rusty-tomentose beneath. Filaments hairy 4. L. Wightiana.
Leaves triple-nerved. Perianth-segments 4, deciduous. Stamens 6 ... ... 5. L. zeylanica.

1. L. tomentosa, Herb. Heyne ex Wall. Cat. 2550; Fl. Br. I. 5, 157; Trimen Fl. Ceyl. 3, 449; Cooke Fl. Pres. Bomb. 2, 539; Gamble Ind. Timb. 570; *Tetranthera apetala,* Grah. Cat. Bomb. Pl. 174 (not of Roxb.); Dalz. & Gibs. Bomb. Fl. 222. *Chikna,* M. *Dhade-mara,* K.

A small or moderate-sized evergreen tree; branchlets thick, yellowish-tomentose. Leaves crowded at the ends of the branches, elliptic or obovate, 3·5″-8″ by 1·5″-2·5″, acute or shortly acuminate at the apex, acute at the base, coriaceous, glabrous except on the nerves above, yellowish brown-pubescent beneath; lateral-nerves 12-15 pairs, strong and prominent beneath; petioles ·25″-·5″ long, hairy. Flowers pale-yellow, in solitary, peduncled, globose, umbellate, many-flowered heads, ·25″-·5″ in diameter; peduncles stout hairy, often drooping, ·75″ long; bracts 4, large, rounded, concave, tomentose. Perianth-tube short, hairy; lobes usually O. Stamens about 20; filaments slender, hairy; glands stalked flattened, capitate; staminodes in female flowers numerous, strap-shaped. Fruit depressed-globose, ·5″ in diameter, black when ripe.

Western peninsula, Deccan ghâts, up to 4500′ on the Mahableshwar plateau in moist monsoon-forest, from the Konkan southwards to Ceylon up to 4000′, N. Kanara in rain-forest not nearly so common as *L. sebifera,* var. *tomentosa,* from which it scarcely differs. Fl. Dec. Fr. Feb.-Mch. Bark smooth and thin. Wood grey, smooth, hard and compact. Pores small, often in short radial lines.

Medullary rays moderately broad or fine, distinct. Weighs about 45 lbs. to the cub. ft. In N. Kanara does not yield timber of large dimensions and is scarcely used by the natives.

2. L. sebifera, Pers. Syn, ii 4; Var. *tomentosa*, Fl. Br. I. 5, 158; Gamble Ind. Timb. 570; *L. chinensis*, Lam. Encyc. Method. 3, 574; Trimen Fl. Ceyl. 3, 449; Cooke Fl. Pres. Bomb. 2, 539. *Maida-lakadi*, Vern.

A small or moderate-sized, variable tree; branchlets slender, more or less densely tomentose. Leaves crowded at the ends of the branches, ovate, 3·5″-7″ by 1·5″-3″, obtuse or acute at the apex, acute at the base, coriaceous, glabrous above, more or less pubescent and pale beneath, lateral-nerves about 10 pairs arching upwards and uniting within the margin, strong beneath; petioles ·25″-·5″ long, hairy. Flowers white or yellowish, in axillary, pedunculate, many-flowered corymbose or racemose, tomentose, umbels; buds globose about ·2″ in diameter; peduncles slender, ·75″ long, tomentose, with small, thick, linear bracts at the base of the short corymb-branches. Perianth-tube long, silky; lobes O. Stamens 9-20; filaments long, softly hairy; glands stipitate. Fruit globose, ·25″ in diameter, purple when ripe.

Hotter parts of India; throughout the Konkan and N. Kanara in rain-forest, common in the Siddapore and Kumpta talukas. Fl. May-July. Fr. Jan.-Feb.

Usually a small tree. Bark smooth; inner-bark viscous. Wood greyish-brown, moderately hard, shining, close-grained and durable. Annual-rings distinct. Pores medium-sized, usually subdivided, equally distributed. Medullary rays fine or very fine and moderately broad. The wood is not much used in N. Kanara as the tree is only found fairly common in out of the way jungles. The glutinous bark mixed with goat's milk serves as an application for sprains and bruises in Ceylon.

3. L. Stocksii, Hook. f.; Fl. Br. I. 5, 176; Cooke Fl. Pres. Bomb. 2, 539; Gamble Ind. Timb. 572; *Cylicodaphne myristicæfolia,* var. *acutata,* Meissn. l. c. 209 (the Kanara plant only).

A large or small evergreen tree; branchlets stout, glabrous. Leaves alternate or subopposite, ovate, obovate, lanceolate or sometimes oblanceolate, 2·5″-9″ by 1·25″-3″, obtuse or subacute at the apex, acute at the base, coriaceous, glabrous, dark-green shining above, glabrous or sometimes rusty-pubescent on the nerves, yellowish-brown or white glaucous beneath; lateral-nerves 8-12 pairs impressed above more or less strong and prominent beneath; petioles ·25″-·5″ long, stout, rugose. Umbels 4-8-flowered, (each umbel often with 6 flowers round a central one); males in axillary, suberect racemes about 4″ long; female racemes and umbels much smaller than the male. Flowers yellow, ·3″ long. Bracts 4-6, outer 2-3 thick, brown-tomentose, inner silky yellowish-tomentose. Perianth-tube, turbinate, silky-tomentose; lobes ovate, usually 6, about ·2″ long, imbricate, silky-

tomentose outside, glabrous within. Stamens usually 12; filaments glabrous; inner row of 4 with 2 white glands at the base of each filament. Ovary minute. Female fl. Staminodes 9-12 (in 2-merous flowers 6). Ovary free or enclosed in the perianth-tube; style long or short; stigma usually irregularly lobed. Fruit ovoid, ·5″ long, smooth, black-purple when ripe, seated on the cup-shaped, enlarged perianth-tube; pedicels ·25″ long, thick, angular.

A very variable species closely allied if not identical with *L. Wightiana,* Wall. Sir J. Hooker gives 2 varieties in the Fl. Br. I. viz. var. *acutata* and var. *glabrescens,* both are found in N. Kanara and appear to me to differ specifically from *L. Stocksii,* proper. The variety *acutata* was considered by Sir G. King to be identical with *L. læta,* Wall. var. *glauca* a Ceylon plant.

Western peninsula from the Konkan southwards in rain-forest, common on the N. Kanara ghâts. Var. *glabrescens,* is found on the Mahableshwar plateau and the var. *acutata,* is fairly common on the Nilkund ghât and in the Southern talukas of N. Kanara. Fl. Aug.-Nov. Fr. Mch.-Apl. Bark smooth, brownish. "Wood yellowish, moderately hard. Pores small single or in twos or trees, evenly distributed. Medullary rays fine, short, numerous and regular" Gamble.

4. L. Wightiana, Wall. Cat. 2557; Fl. Br. I. 5, 177; Cooke Fl. Pres. Bomb. 2, 540; Gamble Ind. Timb. 572; *Tetranthera Wightiana,* Bedd. Fl. Sylv. t. 293; *Cylicodaphne Wightiana,* Nees, in Wall. Pl. As. Rar. 2, 68 and 3, 31; Dalz. & Gibs. Bomb. Fl. 222. *Hammadi,* K.

A large tree; branchlets rusty-tomentose. Leaves alternate, very variable in size, elliptic or obovate, 3·5″-7″ by 2″-3″ obtuse, acute or shortly acuminate at the apex, acute at the base, coriaceous, dark-green, glabrous shining above, brown-pubescent beneath; lateral-nerves about 12 pairs looping within the margins and very strong beneath; petioles ·25″ long, stout, tomentose. Umbels 4-6-flowered, brown-tomentose, in axillary, stout racemes 2″-4″ long; pedicels short, stout; bracts 4, coriaceous. Perianth-tube turbinate, silky-tomentose; lobes 6, silky-tomentose. Stamens 12; filaments hairy. Stigma discoid. Fruit ovoid or subglobose, ·6″ long, shortly and stoutly stalked, seated on the truncate or obscurely toothed, enlarged, cup-shaped perianth-tube.

Western peninsula from the Konkan southwards to the Nilgiris and up to 6000′, on the Southern ghâts of N. Kanara in rain-forest, common in the jungles near the Falls of Gairsoppah. "Bark light-brown, smooth. Wood yellowish-brown shining, hard. Pores small, often subdivided in groups of 2-3. Medullary rays fine, white, numerous. Annual-rings faintly marked. Weighs 46 lbs. to the cub. ft." Gamble.

5. L. zeylanica, Nees, Cinnamom. Disput. 58; Fl. Br. I. 5, 178; Brandis For. Fl. 382; Cooke Fl. Pres. Bomb. 2, 540; Wight Ic. tt. 132, 1844; Bedd. Fl. Sylv. t. 294; Gamble Ind. Timb. 573; Trimen Fl. Ceyl. 3, 454. *Kanvel, chirchira,* M. *Bili-nisangi,* K.

A small evergreen tree; branchlets slender, glabrous. Leaves crowded at the ends of the branches, ovate or elliptic-lanceolate, 3″-5″ by 1·5″-2·5″, acuminate at the apex, acute at the base, subcoriaceous, glabrous, dark-green shining above glaucous beneath, distinctly and strongly 3-nerved at the base; petioles ·3″-·75″ long. Umbels in small, sessile, 4-5-flowered, axillary clusters; bracts silky. Perianth-tube turbinate, hairy; lobes 4, acute, deciduous, silky-tomentose. Stamens 12; filaments hairy. Style sublobate. Fruit globose or ovoid, ·5″ in diameter, dark-purple when ripe seated on the lobed or truncate, disk-like perianth-tube.

Bhotan and Khasia mountains, Chittagong, Pegu and Tenasserim, Western peninsula from the Konkan southwards, ascending to 7000′ on the Nilgiris; Ceylon in the moist zone; throughout the Konkan and N. Kanara in moist monsoon and rain-forest. Fl. Oct.-Jany. Fr. Jany.-Feb. Bark thick, smooth, grey. Wood reddish-white; heartwood darker in colour, moderately hard, even-grained and tough. Pores small, subdivided. Medullary rays fine, numerous. Used for house-building, planks etc. The seeds yield an oil used for burning.

Cassytha filiformis, Linn. *Amar-vel*, M. A slender, twining, leafless, herbaceous parasite is common in hedges throughout the presidency, often found on *Ipomœa biloba* near the sea coast.

Order LXXVII.—HERNANDIACEÆ.

Large trees or climbing shrubs. Leaves alternate, without stipules. Flowers hermaphrodite or monœcious, in panicled cymes or involucrate heads. Perianth lobes 4-10. Stamens 3-5; anther-cells 2, opening by valves. Ovary inferior, 1-celled with one pendulous ovule. Fruit usually winged, exalbuminous.

The *Hernandiaceæ* of Engler and Prantl constitutes a small natural order containing 3 genera; of these *Illigera* and *Gyrocarpus* are included in the *Combretaceæ* and *Hernandia* in the *Lauraceæ* by many authors. Baillon in his Histoire Naturelle des Plantes includes all three in the *Lauraceæ*. *Gyrocarpus* is the only genus of the order found within the limits of the Bombay presidency.

GYROCARPUS, JACQ.

A large or small tree. Leaves alternate, long-petioled. Flowers small, very numerous, unisexual and monœcious. Male flowers numerous. Calyx 4-7-divided. Petals O. Stamens 4-7, inserted at the base of the calyx with alternate, clavate glands; anthers 2-celled, opening (as the anthers of *Lauraceæ*) by lateral valves. Ovary O. Female flowers few. Calyx-limb 2-divided, adnate to the ovary, accrescent in fruit. Petals and stamens O. Ovary 1-celled; ovule solitary, pendulous. Fruit drupe-like, crowned with the long, 2-winged calyx-lobes; nut bony. Seed oblong, terete; cotyledons convolute, stalked.

G. Jacquini, Roxb. Fl. Ind. 1, 445: Fl. Br. I. 2, 461; Gamble Ind. Timb. 350; Trimen Fl. Ceyl. 2, 166; *G. americanus*, Jacquin. Select. Stirp. Americ. 282. t. 178, fig. 80; Cooke Fl. Pres. Bomb. 1, 486.

A moderate-sized, deciduous tree; branches marked with the scars of the fallen leaves; branchlets stout, glabrous. Leaves broadly ovate or sometimes rhomboid, 4″-5″ long by nearly as broad, acuminate at the apex, broadly truncate, cordate or cuneate at the base, glabrous above, densely stellate-hairy beneath; 3-basal-nerved; petioles 2″-5″ long, slender. Flowers small, yellowish, ebracteate, in clustered, terminal, dense, compound, pubescent cymes; males numerous; females few, all on slender pedicels. Calyx densely pubescent. Stamens alternating with hairy, clavate staminodes. Fruit ovoid, about ·6″ long furrowed in the upper half, wrinkled below; wings like those of a *Dipterocarp*, linear-spathulate, about 3″ long by ·5″ broad in the widest part, coriaceous, striate, pubescent, greyish-brown; stone ovoid, furrowed.

Southern India, Tenasserim and the Andamans, "Deccan on the banks of the Nulutwar" Grah. Belgaum and Bijapore districts in dry deciduous forests on sandstone. Fl. July.-Aug. Fr. C. S.

Bark smooth, shining, whitish. Wood grey, soft and light. Pores large and moderate-sized, often subdivided, uniformly distributed. Medullary rays short and moderately broad giving a well marked silvery grain. Weighs about 22 lbs. to the cub. ft. Used in Southern India for toys, boxes etc. also for making catamarans in Ceylon. The seeds are sometimes strung into necklaces.

Order LXXVIII.—THYMELÆACEÆ.

Trees or shrubs. Leaves simple, entire, alternate or opposite. Flowers bisexual, regular, in axillary or terminal heads, clusters or racemes. Perianth regular, tubular or campanulate, often corolline, 4-5-lobed; lobes imbricate in bud; throat with or without scales. Stamens usually as many or twice as many as the perianth-lobes. Disk annular, cupular or of scales. Ovary free, 1-(rarely 2-) celled, with a single, pendulous ovule; style simple or O; stigma capitate. Fruit usually indehiscent. Seed pendulous or lateral; albumen fleshy or O; embryo straight; radicle superior.

LASIOSIPHON, FRESEN.

Small trees or shrubs. Leaves opposite or scattered. Flowers hermaphrodite, in dense, bracteate heads. Perianth-tube cylindrical, circumcissile above the ovary; lobes 5, spreading; scales 5-10, inserted above the stamens. Stamens 10, upper or all slightly exserted. Disk O or short, annulate. Ovary sessile, 1-celled; style filiform; stigma capitate. Fruit small, dry; pericarp membranous. Seed with a crustaceous testa; albumen scanty or O.

L. eriocephalus, Dcne. in Jacq. Voy. Bot. 148; Fl. Br. I. 5, 197; Bedd. Fl. Sylv. 179; Gamble Ind. Timb. 578; Cooke Fl. Pres. Bomb. 2, 542; *L. speciosus,* Dcne. l. c. 147, t. 150; Dalz. & Gibs. Bomb. Fl. 221. *Rami, ramita,* M. *Mukurgal,* K. *The Woolly-headed Gnidia.*

A much-branched shrub or small tree; branches slender, glabrous. Leaves subsessile, oblong-lanceolate or linear, 2″-3″ by ·75″-1″, acute or obtuse, and apiculate at the apex, acute at the base, thin, glabrous and somewhat glaucous above, glabrous or silky beneath. Flowers yellow, subsessile, in erect, dense, terminal, bracteate heads; bracts large, ovate, imbricate, silky, deciduous, forming a basal involucre. Perianth-tube slender, ·4″ long, silky-hairy outside with long white hairs in the lower part; lobes oblong, ·1″ long, obtuse with a linear often bifid scale at each division. Anthers nearly sessile, included. Fruit ellipsoid-oblong, about ·5″ long, enclosed in the perianth-tube.

Western peninsula on the ghâts from the Konkan southwards in monsoon-forest, ascending to 4500′, common on the Mahableshwar plateau and in the Supa forests of N. Kanara on laterite, Nilgiris rising to 7000′ and in Ceylon up to 4000′. Fl. Oct.-Feb. Fr. Mch.-Apl. Bark grey, smooth; inner-bark fibrous. Wood yellowish-white, moderately hard. Annual-rings marked by a line of pores

more or less distinct. Pores small, in small groups or lines, enclosed in white tissue. Medullary rays fine, irregularly spaced. Weighs about 38 lbs. to the cub. ft. The bark is a powerful vesicant and is employed in native medicine as an external application. Both the bark and leaves are used to poison fish. The bark also yields a useful fibre which it is suggested would be suitable for paper making.

Fig 466. Lasiosiphon eriocephalus, Dcne.

Order LXXIX.—ELÆAGNACEÆ.

Shrubs or trees, silvery or brown-scaly. Leaves alternate or opposite, entire; stipules O. Flowers small, regular, hermaphrodite or diœcious, white or yellow, in axillary clusters, spikes or racemes. Perianth tubular and in the bisexual or female flowers constricted above the ovary, 2-6-cleft; lobes valvate in bud. Stamens usually 4 alternate with the perianth-lobes. Ovary free, 1-celled with a solitary, erect ovule. Fruit indehiscent, enclosed within the accrescent perianth-tube. Seed ascending; albumen O or scanty; embryo straight, axile; cotyledons thick; radicle inferior, very short.

ELÆAGNUS, Linn.

Trees or shrubs. Leaves alternate, densely silvery-scaly beneath. Flowers hermaphrodite or unisexual by abortion; bracts O. Perianth limb 4-cleft; lobes valvate, deciduous. Stamens 4 on the mouth of the perianth; filaments short. Ovary 1-celled; style linear, included; stigma lateral. Fruit with a bony or coriaceous endocarp.

E. latifolia, Linn. Sp. Pl. (1753) 121; Fl. Br. I. 5, 202; Bedd. Fl. Sylv. t. 180; Brandis For. Fl. 390; Cooke Fl. Pres. Bomb. 2, 543; Gamble Ind. Timb. 581; *E. Kologa,* Schl.; Dalz. & Gibs. Bomb. Fl. 224. *Nurgi, ambgool,* Vern. *Halige-balli,* K. *Nildook,* M.

A large climbing shrub with spinous stems up to 4″ in diameter at the base; spines strong, often curved; branchlets scurfy with rusty, shining scales. Leaves ovate or elliptic-lanceolate, 1·5″-4″ by 1″-2″, obtuse or rounded at the apex, acute at the base, thin, glabrous above, densely covered with peltate, rusty or silvery scales beneath; margins often undulate; petioles ·25″-·5″ long, scaly. Flowers in 2-5, shortly peduncled, axillary clusters; peduncles scaly. Perianth about ·3″ long, fleshy, densely white silvery-scaly; lobes ovate, ·12″ long, acute, spreading. Style short, hairy. Fruit ovoid-oblong, about 1″ long with a subacid, fleshy, pink perisperm covered outside with silvery scales; endocarp with 8 longitudinal ribs; putamen coriaceous; cotyledons fleshy, covered with thick felt.

Hilly parts of tropical India, Khasia hills, Eastern Bengal, Burmah. Western peninsula on the ghâts from the Konkan southwards, up to 7000′; in the Nilgiris, Ceylon at all elevations; common throughout the presidency in or near evergreen monsoon or rain-forest. Fl. Nov.-Feb. Fr. May-July. Bark dark-brown with corky, lenticular excrescences, shallow-fissured and peeling off at the base in thick

scales; inner-bark red. Wood white, grey or reddish with yellowish patches near the large central pith. Annual-rings more or less distinct. Pores large and small, numerous, uniformly distributed. Medullary rays fine to moderately broad, short, showing a silver-grain. Weighs 42 lbs. to the cub. ft. Yields a good fuel. The edible fruit is sold in the hill bazaars; it has a pleasant, subacid flavour.

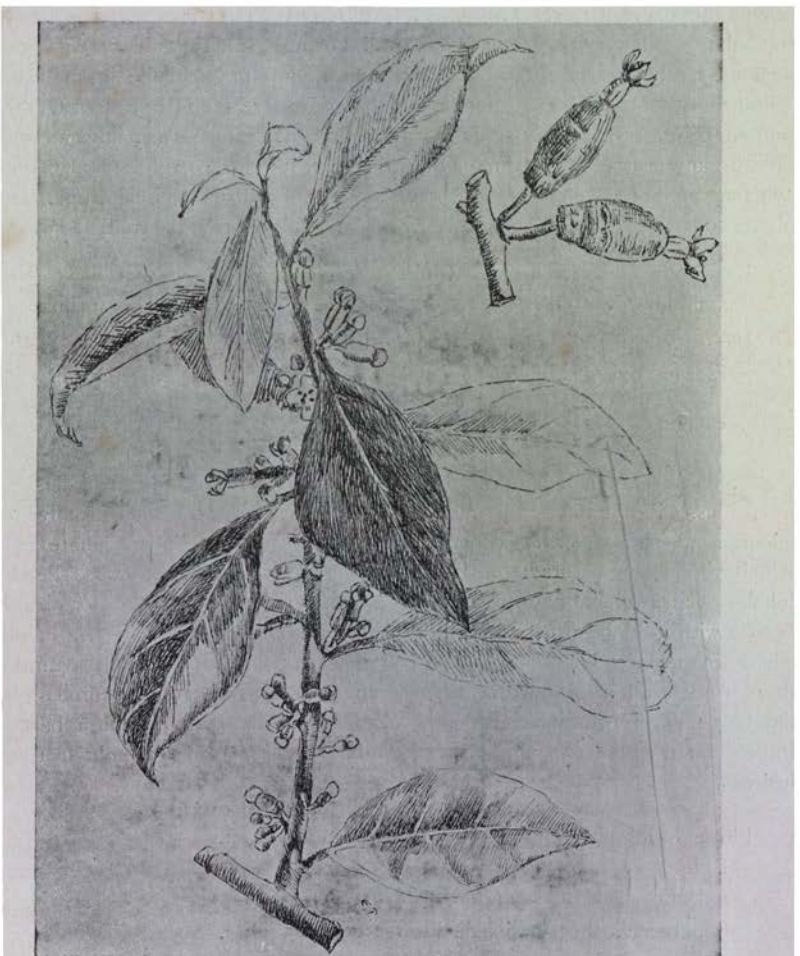

Fig 467. Elæagnus latifolia, Linn.

Order LXXX.—LORANTHACEÆ.

Parasitic evergreen, much-branched shrubs often with jointed branches. Leaves opposite (rarely alternate) coriaceous, sometimes wanting, entire, exstipulate. Flowers regular, hermaphrodite or unisexual, in axillary clusters or racemes, rarely solitary usually bracteate and often 2-bracteolate; bracts usually scale-like with 2 bracteoles. Calyx adnate to the ovary; limb truncate or O, rarely toothed. Petals 4-8, free or connate, valvate in bud. Stamens as many as corolla-lobes usually inserted on them. Ovary inferior, 1-celled; ovule solitary, erect; style long or short; stigma simple. Fruit a one-seeded usually viscid drupe. Seed adnate to the pericarp; albumen fleshy or O; embryo straight; radicle superior.

Leafy parasites with hermaphrodite, often large and showy flowers ... ... 1. Loranthus.

Parasites with the leaves often reduced to scales. Flowers unisexul, inconspicuous ... ... 2. Viscum.

1. LORANTHUS, LINN.

Parasitic branched shrubs. Leaves alternate or opposite, thick, fleshy or coriaceous. Flowers hermaphrodite, in axillary clusters or racemes, usually large, coloured and showy; bracts concave or oblique, cup-shaped or connate into a bell-shaped involucre; bracteoles 2, free or connate with the bract or O. Perianth double. Calyx-tube adnate to the ovary; limb truncate, 4-5-toothed or obsolete. Corolla with 3-8 lobes free or more or less connate into a tube or sheath, often split down one side; lobes 4-5, valvate (often separate petals) elastically separating, often strongly reflexed and revolute. Stamens 4-5, inserted on the corolla-lobes; filaments filiform or thickened. Ovary inferior; style long. Fruit a berry or drupe. Seed adnate to the pericarp; albumen fleshy or O; embryo usually fleshy.

Flowers without bracteoles or an involucral bract.
Bract scale-like.
Petals 4, distinct. *(Phœnicanthemum)*
Leaves short-petioled. Flower-buds ·25″ long, cylindric ... ... 1. L. Wallichianus.
Leaves long-petioled. Flower-buds ·75″ long, 4-angled ... ... 2. L. obtusatus.

Corolla tubular, 4-cleft. Flowers mealy-tomentose. (*Cichlanthus*)
Flowers pedicellate in short, subracemose fascicles ... ... 3. L. Scurrula.
Flowers sessile or subsessile, 1-3 together ... 4. L. Stocksii.

Corolla tubular, 5-cleft. Flowers tomentose or glabrous. (*Dendrophthœ*)
Flowers tomentose. Corolla gibbously inflated 5. L. gibbosus.
Flowers glabrous.
Corolla-lobes shorter than the tube not elastically coiled.
Leaves small, cuneate. Corolla gibbously inflated above the middle ... . 6. L. cuneatus.
Leaves large, elliptic-oblong. Corolla slightly dilated above the middle .... 7. L. longiflorus.
Corolla-lobes longer than the tube, elastically coiled ... ... 8. L. elasticus.

Flowers few, enclosed in a large bell-shaped, 5-lobed involucre (*Tolypanthus*) ... . 9. L. lageniferus.

Flowers acicular with the bract and bracteoles forming a shallow oblique cup (*Macroselen*).... .... 10. L. trigonus.

Flowers with a pair of orbicular bracteoles within the bract. (*Elytranthe*)
Corolla-tube curved, over 1″ long .... 11. L. loniceroides.
Corolla-tube straight, about ·5″ long ... ... 12. L. capitellatus.

1. **L. Wallichianus,** Schultes f. Syst. Veg. 7, 100; Fl. Br. I. 5, 205; Dalz. & Gibs. Bomb. Fl. 109; Cooke Fl. Pres. Bomb. 2, 545; Wight Ic. t. 143. *Banda*, M.

A large much-branched parasite; branches terete, grey, rough, lenticellate. Leaves broadly ovate or sometimes subrhomboid, 2″-5·5″ by 1″-3·5″, obtuse at the apex, acute or obtuse at the base, coriaceous, glabrous; lateral-nerves 4-5 pairs looping within the margins, faint or prominent beneath; petioles short up to ·25″ long. Flowers pale-red about ·15″ long, in axillary or lateral, slender, simple or few-fascicled racemes 1″-3″ long; buds subcylindric; pedicels usually shorter than the flower about ·1″ long; bract small, lateral, oblique at the apex of the pedicel, acute, ciliate. Calyx globose about ·1″ in dimeter with a truncate, annular top. Corolla-limb of 4 distinct petals. Ovary globose. Fruit globose-ovoid, ·2″ in diameter, rugose.

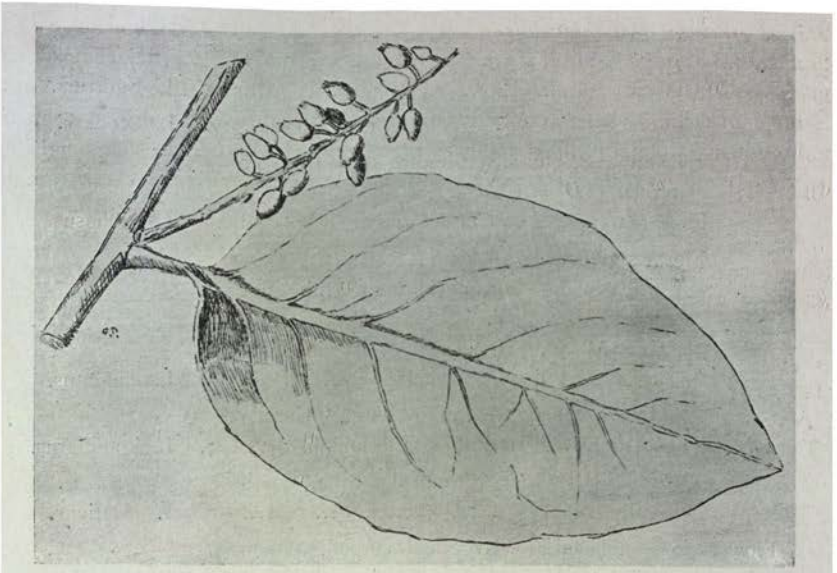

Fig 468. Loranthus Wallichianus, Schultes.

Western peninsula on the ghâts from the Konkan southwards, apparently endemic; common on *Memecylon edule* and other trees in the evergreen monsoon-forests near Karwar, N. Kanara district. Fl. Apl.-June. Fr. Aug.-Sept. Easily distinguished by its small flowers and distinct pale-red petals.

2. L. obtusatus, Wall. Cat. 526; Fl. Br. I. 5, 205; Dalz. & Gibs. Bomb. Fl. 109; Cooke Fl. Pres. Bomb. 2, 546; Grah. Cat. Bomb. Pl. 86.

A robust much-branched, parasitic shrub; branchlets terete, grey, covered with numerous, raised, white, lenticular dots. Leaves broadly ovate, 2·5″-4·5″ by 1·25″-2·75″, obtuse at the apex, acute at the base, coriaceous, glabrous; lateral-nerves 4-5 pairs, usually obscure; petioles ·25″ long, stout. Flowers in slender, axillary racemes, 2″-4″ long; buds slender, and somewhat curved, 4-angled, about ·75″ long; pedicels ·2″ long, slender; bract small, oblique, lateral at the apex of the pedicel, grey-tomentose. Calyx subcylindric, ·1″ long, rough; limb very short, obscurely toothed or truncate. Corolla red outside, dark-purple within; limb 4-angled, splitting into 4, thick, fleshy, obtuse, distinct petals. Stamens 4; anthers black. Ovary nearly globose, rough; style 4-angled, exserted; stigma capitate. Berry ovoid, ·2″ long, rugose.

Western peninsula from the Konkan southwards, apparently endemic; common

in the Supa monsoon-forests of N. Kanara growing on *Xylia dolabriformis Myristica attenuata* and other trees. Fl. Feb.-Apl. Fr. June-July.

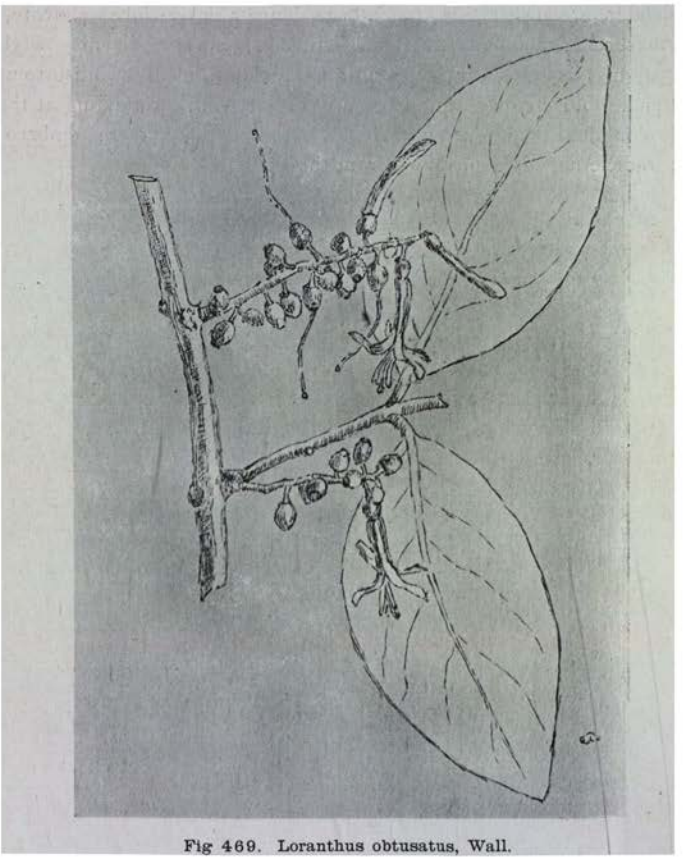

Fig 469. Loranthus obtusatus, Wall.

3. L. Scurrula, Linn. Sp. Pl. 472; Fl. Br. I. 5, 208; Cooke Fl. Pres. Bomb. 2, 546; Trimen Fl. Ceyl. 3, 465; *L. buddleoides*, Desrouss. in Lamk. Encycl. Method. 3, 600; Dalz. & Gibs. Bomb. Fl. 110; Grah. Cat. Bomb. Pl. 66.

A large, much-branched shrub; branches rough, lenticellate; branchlets rusty-tomentose. Leaves opposite, ovate, 1·25″-3″ by ·75″-2″, rounded at the apex, rounded or subacute at the base, coriaceous, glabrous above, more or less buff or rusty tomentose beneath; lateral-nerves about 5 pairs, distinct but not prominent beneath; petioles ·25″-·5″ long. Flowers in very short-peduncled, many-flowered, axillary, simple or fascicled racemes; pedicels short, slender; buds

slender, clavate, often curved, acute; bract small, ovate, oblique, tomentose. Calyx obconic, ·1″ long, rusty-tomentose; limb very short, truncate, entire. Corolla slender, greenish-yellow-tomentose, about ·5″ long; lobes 4, ovate, acute. Stamens exserted; filaments flattened, crimson; anthers linear. Style long slender; stigma capitate. Fruit pyriform, ·4″ long, mealy whitish-tomentose. Albumen pink, obtusely quadrangular at the radicle-end, terminating at the other in a hard, elongated point, surrounded with a thick, sticky layer; embryo green, fusiform; radicle not distinguishable from the tigellus.

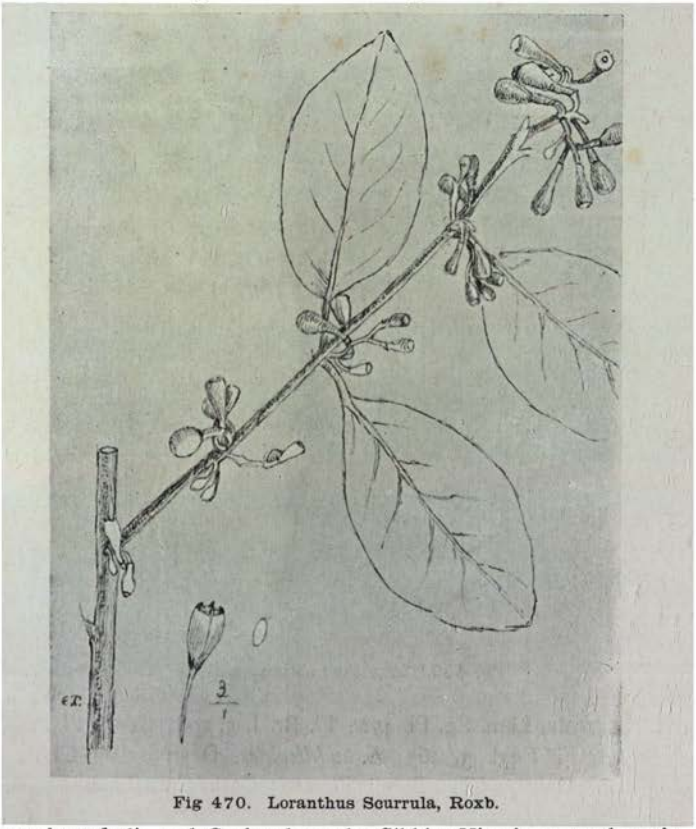

Fig 470. Loranthus Scurrula, Roxb.

Throughout India and Ceylon from the Sikkim Himalaya southwards. One of the most common species in the Konkan and N. Kanara, usually growing on *Pterocarpus Marsupium*, *Leea sambucina* or *Dillenia pentagyna*. Fl. Nov.-Feb. Fr. Dec.-Apl.

4. L. Stocksii, Hook. f.; Fl. Br. I. 5, 213; Cooke Fl. Pres. Bomb. 2, 546. Stems and branches terete, slender, lenticellate. Leaves oblong or orbicular,

·75″-2″ by ·5″-1·5″, obtuse at the apex, rounded or cordate at the base, coriaceous, densely mealy-pubescent when young; lateral-nerves obscure; petioles very short or O. Flowers rusty-tomentose, solitary or 2-3 together on very short, stout, axillary peduncles; bract oblong, obtuse, about ·12″ long, orange red-tomentose. Calyx subglobose, ·12″ in diameter, densely pubescent; limb truncate. Corolla ·6″ long, rusty-tomentose; tube cylindric, curved; lobes 4, spathulate-oblong, obtuse, concave, ·2″ long Fruit pyriform, ·25″ long, tomentose.

A very rare species found by Dr. Stocks in the Konkan, apparently endemic.

5. L. gibbosus, Talb. Trees Bomb. (1902) 289; Cooke Fl. Pres. Bomb. 2, 547; *L. tomentosus*, Talb. List of Trees, (1894) 171, (not of Heyne).

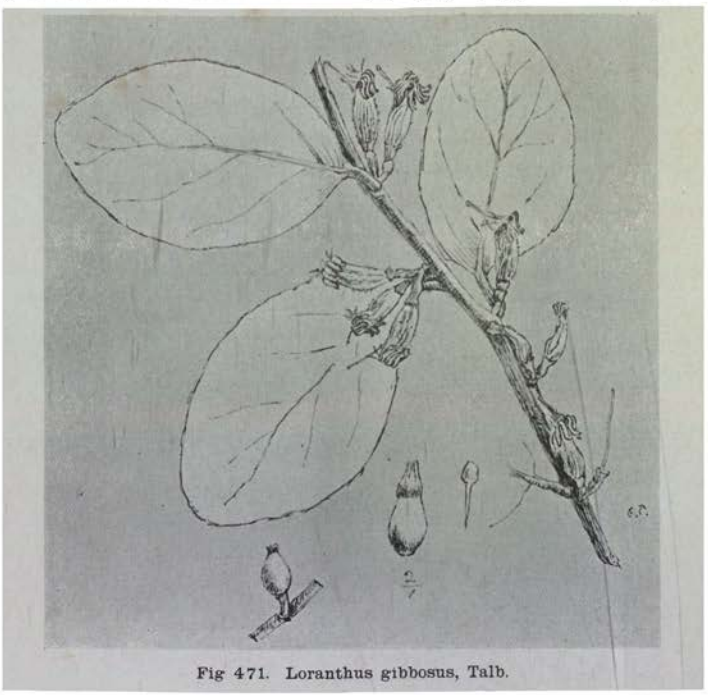

Fig 471. Loranthus gibbosus, Talb.

A large much-branched shrub with long pendant scaly-tomentose branches. Leaves alternate, ovate or suborbicular, 1″-2·5″ by ·5″-1·75″, obtuse, rounded at the apex, subacute at the base, coriaceous, glabrescent above, densely rusty-tomentose beneath; lateral-nerves 2-3 pairs, prominent beneath; petioles ·2″ long, stout, tomentose. Flowers in axillary, 1-5-flowered fascicles; bract thick, orbicular, lateral, shorter than the calyx, rusty-tomentose, ciliate; pedicels ·1″ long, often deflexed. Calyx tubular, ·1″ long, densely rufous-pubescent; teeth very

short. Corolla tubular, curved in bud subsequently broad and gibbously inflated below the middle, ·75″ long, rusty-tomentose; tube split on one side; lobes 5, oblong, reflexed. Stamens exserted; filaments short, flattened; anthers linear. Style long, slender, 4-angled; stigma capitate. Fruit ovoid, ·3″ long, pink. Albumen green with the teeth united into a conical point marked with white lines and slightly swollen round the radicle, having the appearance of a grape-seed; embryo with a globose or ovoid, smooth, dark-green radicle.

Throughout the Konkan and N. Kanara ghát monsoon-forests; very common in the deciduous jungles near Yellapore, usually growing on *Phyllanthus Emblica*, more rarely on *Mussænda frondosa*. Fl. C. S. Fr. Apl.-May.

6. L. cuneatus, Heyne in Roth. Nov. Sp. 193; Fl. Br. I 5, 214; Cooke Fl. Pres. Bomb. 2, 548; Dalz. & Gibs. Bomb. Fl. 110; Trimen Fl. Ceyl. 3, 466. *Archati*, K.

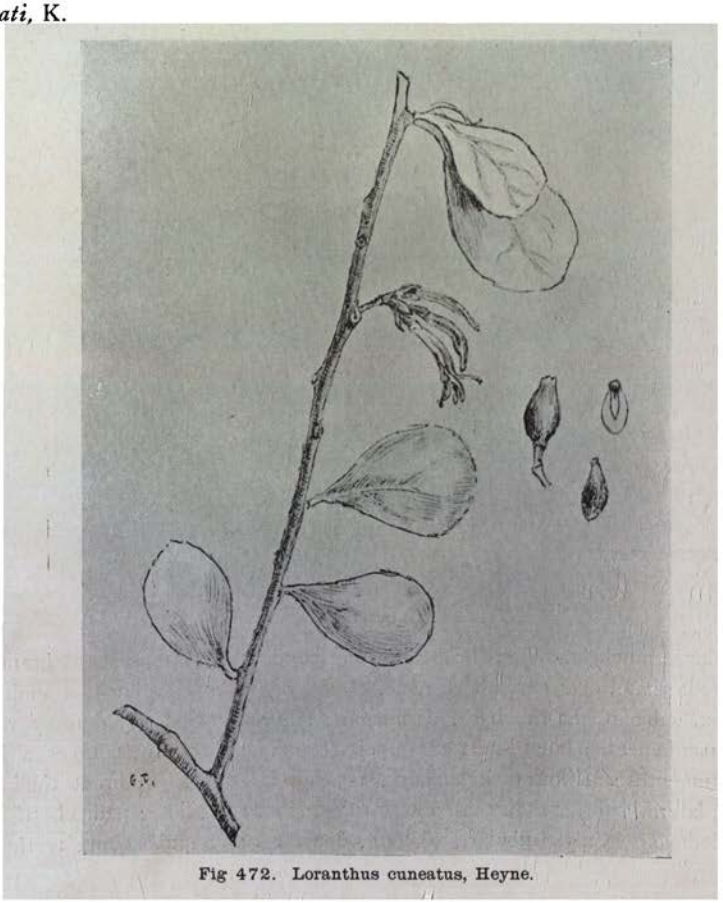

Fig 472. Loranthus cuneatus, Heyne.

A shrub with many, long, slender, grey, lenticellate, pendulous branches. Leaves obovate, 1″-1·5″ by ·25″-·75″, rounded at the apex, cuneate at the base, thick fleshy; lateral-nerves obscure; petioles very short. Flowers 2-5, in axillary, shortly pedunculate fascicles; pedicels short; bract nearly as long as the calyx-tube, ovate-oblique, concave, pubescent and ciliate. Calyx-tube ·1″ long, tubular, pubescent or nearly glabrous; limb very shortly 3-lobed, ciliate or glabrescent. Corolla-tube very slender up to 1″ long, greenish-yellow outside, orange within, slightly gibbous below the middle, split to the base at the back; lobes 5, linear, ·25″ long, acute, recurved. Stamens 5, erect; anthers narrow. Stigma red. Fruit oblong, ·25″ long, crimson, minutely warted. Albumen green; teeth at the top minute, pointed; embryo club-shaped, furrowed; radicle thick, rounded.

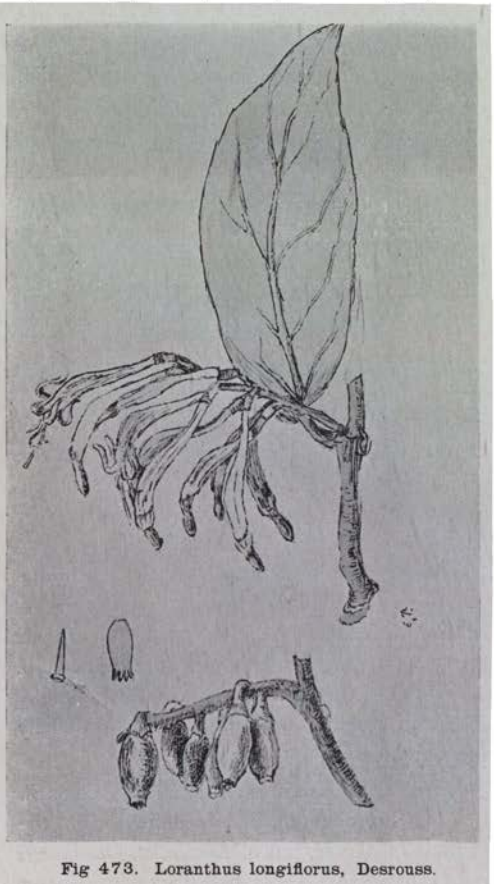

Fig 473. Loranthus longiflorus, Desrouss.

Western peninsula from the Konkan southwards; common in monsoon-forest near Yellapore N. Kanara growing on *Terminalia paniculata, Odina Wodier,* and *Vitex altissima.* Fl. Nov.-Dec. Fr. Jan.-Feb.

7. L. longiflorus, Desrouss. in Lamk. Encycl. Method. 3, 498; Fl. Br. I. 5, 214; Dalz. & Gibs. Bomb. Fl. 210; Gamble Ind. Timb. 583; Brandis For. Fl. 397; Cooke Fl. Pres. Bomb. 2, 548; Wight Ic. t. 302; Trimen Fl. Ceyl. 3, 468; *L. bicolor,* Roxb. Fl. Ind. 1, 548; var. *falcata,* Kurz For. Fl. 2, 321; var. *amplexifolia,* Thw. Enum. 124; Grah. Cat. Bomb. Pl. 86. *Banda, bandgul, betungli, cainguli,* Vern. *Vanda,* M. *Muduk, bendudka,* K. *Vando,* Guz. *Vendha,* Bhil.

A large bushy shrub; branches terete, grey, glabrous, rough with open, reddish lenticels. Leaves usually opposite, variable in size and shape, ovate to

linear-oblong, 4″-7″ by 1″-4″, obtuse or acute at the apex, acute or rounded at the base, coriaceous, glabrous; lateral-nerves slender, sinuate branched, obscure, midrib strong and prominent beneath, sometimes reddish coloured; petioles ·1″-·5″ long. Flowers in short, supra-axillary, erect, unilateral racemes, 1-2 from each axil; pedicels short more or less grey-tomentose; bract $\frac{1}{4}$ the calyx-tube, orbicular, lateral, more or less tomentose. Calyx tubular, ·15″ long, sometimes slightly widened at the top, more or less white-hoary; limb truncate or obscurely 5-toothed. Corolla 1″-2″ long; tube slender, slightly dilated upwards and constricted at the top, curved, usually pink or yellowish-white; lobes linear, green, 5″ long, reflexed. Filaments as long as or shorter than the anthers, pubescent. Fruit cylindrical-ovoid, ·6″ long, curved, seated on the green, cup-shaped bract, pale-pink, smooth, crowned with the calyx-limb. The glutinous covered, white albumen is easily separated from the epicarp which opens at the base; albumen copious with 5 linear, apical teeth surrounding the small, solid, club-shaped, green embryo; radicle flattened.

Temperate and tropical Himalaya from Oudh eastwards to Assam and southwards to Ceylon and Malacca; throughout the presidency in monsoon-forest on many different kinds of trees; the most common *Loranthus* in our Western peninsular forests. Fl. Dec.-Feb. Fr. ripe Feb.-May. Wood reddish, moderately hard. Pores small, very numerous. Medullary rays short, fine to very broad. A variable species. The flowers have the corolla-tube usually yellowish-white with green lobes.

Var. *amplexifolia* is often found growing on *Flacourtia montana* and var. *falcata* on *Careya arborea*. Var. *pubescens* on *Flacourtia, Chloroxylon*, etc.

Var. *coccinea*. A stout bushy, much-branched shrub; branches lenticellate. Leaves usually subopposite, broadly ovate, 2″-6″ by 1·25″-3·5″ obtuse at the apex, acute at the base; lateral nerves 5-6 pairs, distinct beneath; midrib prominent; petioles very short. Flowers in axillary, lax, secund racemes shorter than the leaves; pedicels short, glabrous; bract orbicular, lateral, oblique, ·05″ long. Calyx urn-shaped, ·2″ long; limb often 1-5-notched with a thin, scarious margin, glabrous and more or less rugulose. Corolla up to 2·5″ long, bright-scarlet; tube slender, slightly dilated upwards; lobes linear, short, light-scarlet or greenish. Filaments scarlet. Fruit ovoid, ·5″ long, crowned with the calyx-limb, dark-coloured, glabrous, rugose. The teeth of the albumen as well as the sticky layer are longer than in *L. longiflorus*, proper; embryo white, slender gradually thickened towards the apiculate radical end.

A stout parasite growing on *Terminalia bellerica* in N. Kanara. Fl. C. S. Fl. May-June. The bark contains tannin. Reproduction mainly depends on the agency of birds. In an interesting article on the spread of *Loranthus longiflorus* in the Konkan (Ind. Forester 1899) G. M. Ryan finds that Tickell's Flower-

pecker, (*Dicæum minimum*, Tickell) feeds on the seeds of this species which pass intact through the body of the bird and adhere to the branches of the tree on which it is perched. In the germinating embryo the green, rounded, cap-like radicle is always turned towards and adheres firmly to the foreign object by means of a pellucid gum. The margins of the radicle increase considerably in size developing a ring of young rootlets. The albumen turns yellow and becomes more and more cylindrical.

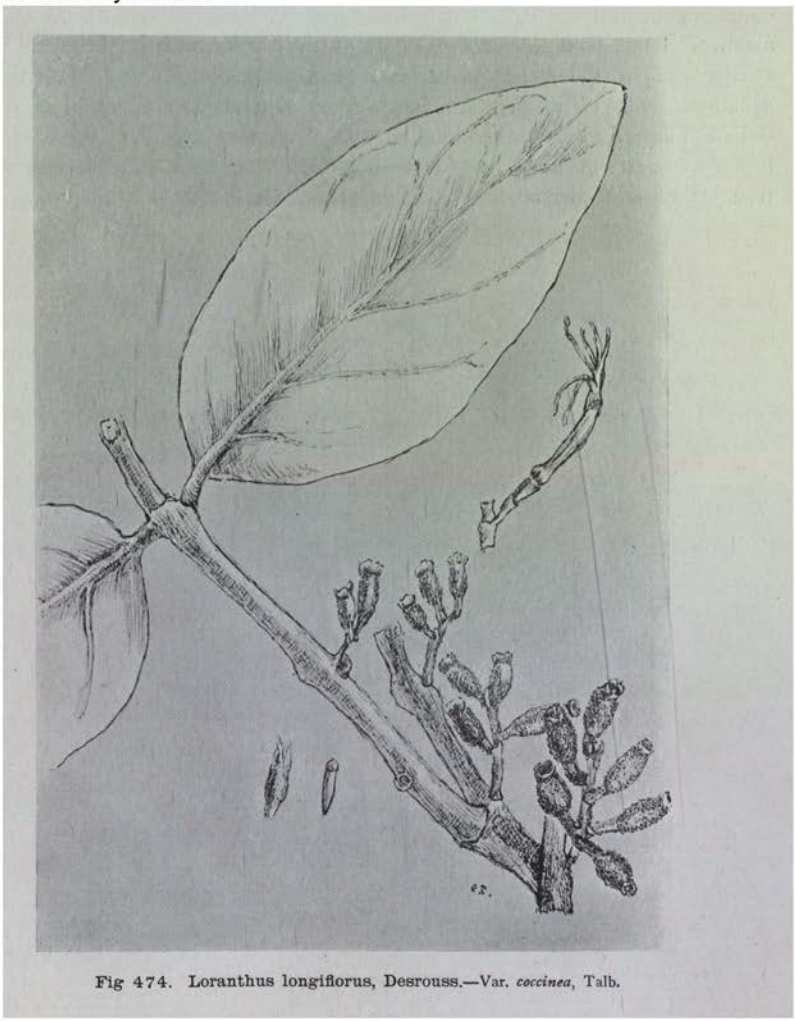

Fig 474. Loranthus longiflorus, Desrouss.—Var. *coccinea*, Talb.

8. L. elasticus, Desrouss. in Lamk. Encycl. 3, 599; Fl. Br. I. 5, 216; Cooke Fl. Pres. Bomb. 2, 547; Dalz. & Gibs. Bomb. Fl. 109.

A large, much-branched glabrous shrub; branches terete, covered with large, scattered lenticels. Leaves opposite, red when young, ovate or suborbicular, 1·5″-4″by ·75″-1·75″, obtuse at the apex, acute at the base, coriaceous, dark-green, glabrous above, pale beneath; lateral-nerves 3-5 pairs, obscure; petioles very short. Flowers sessile, fascicled at the thickened, axillary nodes; bracts small, orbicular, obtuse, lateral at the base of the calyx-tube, glabrous. Calyx tubular or subglobose about ·1″ long; limb truncate. Corolla greenish-white with bright-green veins, slender, straight, 1″ long; lower half of tube obtusely 5-angled, upper half tubular-cylindrical, split; lobes 5, linear, longer than the tube, spirally and elastically coiled. Filaments red; anthers long, narrow. Style slender, red, exserted; stigma fusiform. Berry ovoid, ·5″ long, smooth pink; albumen white, 5-toothed at the top; embryo club-shaped, the radicle end covered with minute knobs.

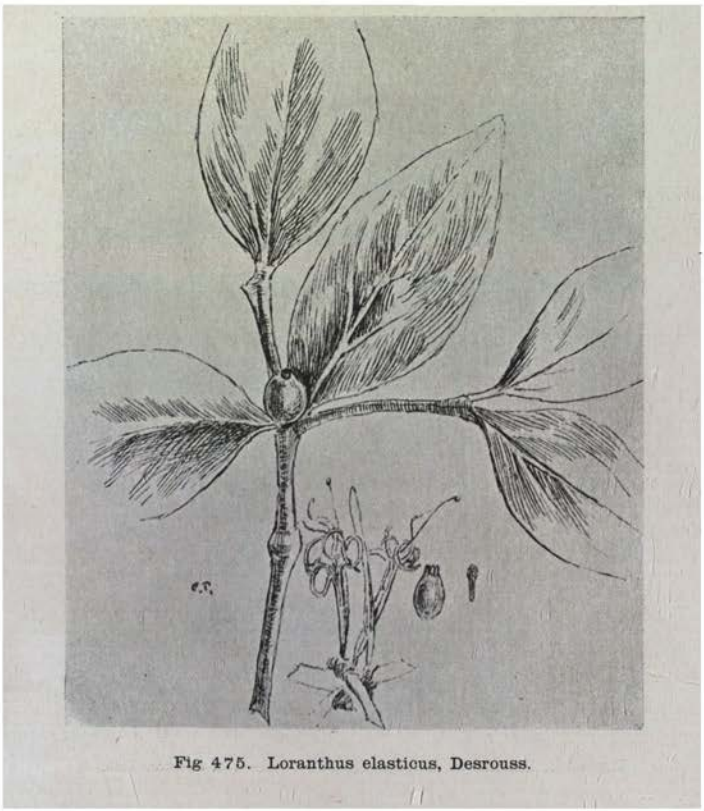

Fig 475. Loranthus elasticus, Desrouss.

Western peninsula from the Konkan southwards, Mahableshwar 4500′; throughout the Konkan and N. Kanara, very common on *Mango* trees also on *Ficus religiosa* and *Casuarina* near the sea-coast. Fl. July-Aug. Fr. Apl.-May. A very distinct species, apparently endemic.

9. L. lageniferus, Wight Ic. t. 306; Fl. Br. I. 5, 216; Dalz. & Gibs. Bomb. Fl. 110; Cooke Fl. Pres. Bomb. 2, 550. *Bandguli,* M.

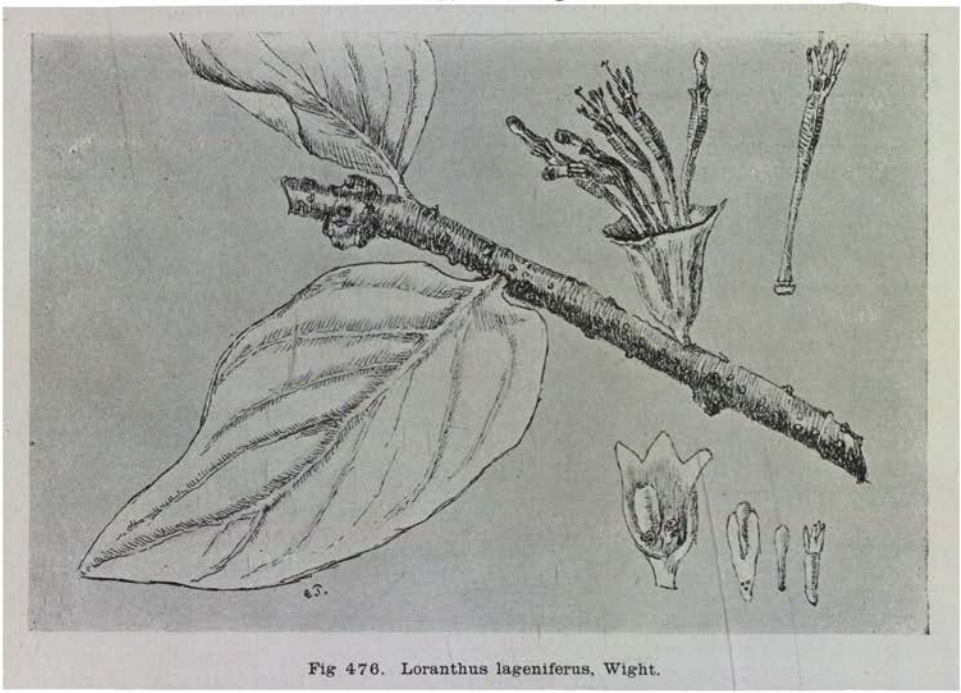

Fig 476. Loranthus lageniferus, Wight.

A large stout-branched shrub; branches smooth, shining dark-brown, covered with raised, open, white or reddish lenticels. Leaves opposite, alternate or sometimes fascicled, elliptic or suborbicular, 2″-5″ by 1·5″-4″, obtuse or subacute at the apex, rounded or acute at the base, thinly coriaceous, glabrous; lateral-nerves 2-4 pairs, distinct; petioles ·25″ long. Involucres shortly peduncled, single or few-fascicled on the naked branches, broad-campanulate, ·75″-1·25″ long, green or purple-spotted, obtusely triangular 5-lobed or lobes obsolete, containing 5-6 sessile flowers. Calyx ·1″ long; limb truncate or obscurely toothed, more or less pubescent, somewhat ciliate on the margins. Corolla 1·5″ long; tube dilated upwards, red below, green above with an annular, transversely rugose enlargement at the top; lobes short, linear-oblong, narrow, subacute, green with reddish tips, puberulous.

Stamens inserted on the enlarged neck of the corolla; filaments subulate, as long as the anthers; anthers reddish, about ·1″ long. Style red; stigma capitate. Berry ovoid, ·4″ long by ·2″ thick, pink or yellow; albumen white, 5-toothed, thick at the radicle end of the embryo; embryo green with an exserted, ovoid radicle; cotyledons conferruminate.

From the Konkan southwards to Malabar, growing on *Helicteres Isora* in the Tannah district also in monsoon-forest N. Kanara on *Adina cordifolia.* Fl. Apl.-May-June. Fr. July-Aug.

The bell-shaped involucre is green in colour when the parasite grows on *Helicteres Isora* and purple-spotted on *Adina* or other species.

10. L. trigonus, Wight & Arnott Prodr. 386; Fl. Br. I. 5, 219; Cooke Fl. Pres. Bomb. 2, 549. *Gonimaran, bandalaki.* K.

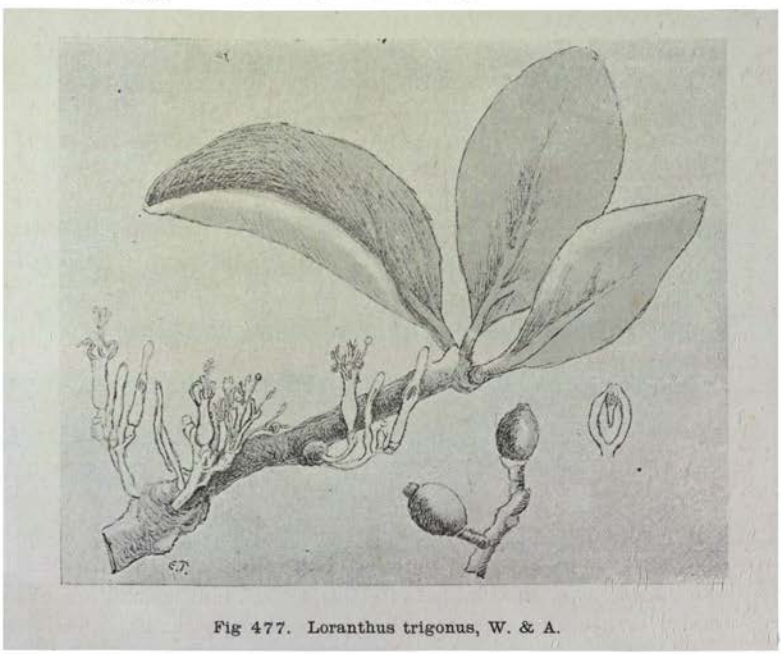

Fig 477. Loranthus trigonus, W. & A.

A robust much-branched shrub; branches brown, glabrous shining, sparsely lenticellate, acutely triangular. Leaves opposite or in whorls of 3, broadly elliptic or obovate, 3″-6″ by 1·75″-4·5″, rounded, subacute or obtuse at the apex, acute at the base, very coriaceous; lateral-nerves 7-8 pairs, obscure; midrib very prominent; petioles short, stout, often winged. Flowers shortly pedicelled, in short, many-flowered, axillary racemes or on the naked branches; bract and bracteoles

connate into a shallow, oblique cup, laterally acuminate and separate from the calyx and as long as the calyx-tube on one side. Calyx ·12″ long; tube globose as long as the truncate, cupular limb. Corolla slender, ·75″ long; tube split on one side, slightly dilated below the middle; lobes linear, about ·25″ long, reflexed. Stamens inserted on the corolla-lobes; filaments angular as long as the linear anthers. Style long, slender; stigma globose. Berry ovoid, ·4″ long, pink, crowned with the calyx-limb. Embryo with a light-green, warted, superior radicle, covered by the 4-5-toothed, white albumen; cotyledons conferruminate.

South Konkan and N. Kanara ghâts in rain and monsoon-forest, common in the N. Kanara (Supa and Siddapore talukas) and Belgaum districts growing on *Ficus mysorensis* and other trees. Fl. C. S. Fr. ripe Apl.-May. A very distinct species apparently endemic.

11. L. loniceroides, Linn. Sp. Pl. 473; Fl. Br. I. 5, 221; Dalz. & Gibs. Bomb. Fl. 110; Cooke Fl. Pres. Bomb. 110; Grah. Cat. Bomb. Pl. 86; Trimen Fl. Ceyl. 3, 469. *Archati*, K.

A large much-branched shrub; branches thickened at the nodes, grey, smooth, lenticellate. Leaves opposite, ovate-oblong, 3″-4″ by 1·5″-1·75″, obtusely acuminate at the apex, rounded and suddenly acute at the base, coriaceous, glabrous shining; margins somewhat repand; lateral-nerves obscure; petioles ·25″-·5″ long. Flowers sessile, in 2-3 decussate pairs arranged in short, axillary spikes; bract thick, ovate, acute, keeled, shorter than the calyx-tube; bracteoles 2, rounded, exceeding the bract. Calyx tubular, ·3″ long; limb truncate. Corolla 6-angled in bud, 1″-1·5″ long; tube funnel-shaped, pink, divided half-way down into 5-6 reflexed, green, linear lobes. Stamens 6; anthers orange, slender, multilocellate. Style exserted; stigma globose. Berry ovoid, ·5″ long, green, crowned with the calyx-limb. Albumen firm, green, grooved and striped longitudinally with 4-5 more or less distinct grey or reddish lines; teeth cohering in a flattened tip; embryo with 2 separate cotyledons jointed to the radicle which has a swollen and flattened end.

Western peninsula from the Konkan to Travancore, Nilgiris up to 6000′, Ceylon; throughout the presidency on various kinds of trees. Fl. Mch-May. Fr. R. S. Scarcely separable from *L. capitellatus*, W. & A. the next species. Dr. T. Cooke in his Fl. Pres. Bomb. states that all the specimens in Kew from the Bombay presidency labelled *L. loniceroides* really belong to *L. capitellatus*.

12. L. capitellatus, Wight & Arn. Prodr. 382; Fl. Br. I. 5, 221; Dalz. & Gibs. Bomb. Fl. 109; Cooke Fl. Pres. Bomb. 2, 550; Trimen. Fl. Ceyl. 3, 470.

A slender-branched glabrous shrub; branches pale-brown, thickened at the nodes, covered with small, white, raised lenticels. Leaves ovate-lanceolate, 2·5″-5″

by 1″-2″, acuminate at the apex, acute or rounded at the base, thinly coriaceous, glabrous shining; lateral-nerves obscure; midrib prominent; petioles ·5″ long, keeled and often winged. Flowers sessile, 3-4 together in axillary, short-peduncled clusters; bract ovate, ·12″ long, acute, keeled, with 2 similar bracteoles above. Calyx ·2″ long; limb cylindric, truncate. Corolla-tube ·25″ long, white, straight, cylindric in bud, afterwards funnel-shaped; lobes 6-angled in bud, green, afterwards red, linear-oblong, spathulate, longer than the tube, reflexed. Stamens 6; anthers multilocellate. Stigma subglobose. Fruit ovoid, ·3″ long, crowned with the calyx limb, black, shining.

Fig 478. Loranthus capitellatus, W. & A.

Western peninsula from the Konkan southwards; N. Kanara in rain-forest growing on *Artocarpus integrifolia* and other trees. Fl. Feb.-May. Fr. R. S. Scarcely differs from *L. loniceroides*.

2. VISCUM, LINN.

Parasitic shrubs; branches jointed and often angled. Leaves opposite, often reduced to small scales. Flowers unisexual, usually monœcious, solitary or fasciculate in the axils or nodes, rarely terminal. Calyx-tube adnate to the ovary, of the male flower solid; perianth-segments 3-4, fleshy, valvate, usually deciduous. Anthers sessile on the perianth-segments, opening by many pores. Ovary inferior with a solitary ovule; stigma large, sessile, pulvinate. Fruit a berry. Seed solitary, often with more than one embryo; albumen fleshy.

Leafy shrubs.
- Leaves more than 1″ long; nervation generally obscure.
  - Leaves obovate, obtuse or sub-acute ... ... 1. V. verruculosum.
  - Leaves truncate or shallowly trilobate ... 2. V. trilobatum.
- Leaves more than 1″ long, elliptic or linear-falcate, distinctly 3-5 basal-nerved ... ... 3. V. orientale.
- Leaves less than 1″ long, obovate spathulate, often wanting ... ... 4. V. capitellatum.

Leafless shrubs.
- Branchlets angled, neither swollen nor contracted at the nodes ... ... 5. V. angulatum.
- Stems and branches flattened, contracted at the nodes ... ... 6. V. articulatum.

1. V. verruculosum, W. & A. Prodr. 379; Fl. Br. I. 5, 224.

Stems terete, sparingly branched; branches opposite or verticellate; branchlets angled and grooved. Leaves drying black, ovate or obovate, ·7″-1·2″ by ·4″-·6″, obtuse or subacute at the apex, acute at the base, coriaceous, glabrous; basal-nerves 3-5 usually obscure in the dried plant; petioles ·1″ long. Flowers in short-peduncled, 3-5-flowered, axillary fascicles. Fruit ovoid, ·25″ long, smooth or sometimes sparsely warted.

N. Kanara growing on *Loranthus trigonus,* W. & A. in rain-forest near Siddapore. Fl. Jan.-Feb. My specimens were named as above in the Calcutta Botanic Garden's Herbarium.

2. V. trilobatum, sp. nov.

A large much-branched shrub; branches terete, drying yellow, somewhat swollen at the nodes; branchlets opposite or whorled, angular, channelled, drying yellow. Leaves triangular-obovate, 1″-1·4″ by ·5″-1″, truncate or trilobate at the apex, middle lobe short, triangular, obtuse, sometimes unequal-sided and narrowed

into the petiole at the base, thinly coriaceous, glabrous, drying black; basal-nerves obscure; petioles flattened, 0-·25″ long. Flowers shortly peduncled, solitary or in pairs seated on the concave, boat-shaped, acute, thick, yellow, shining, connate bracteoles. Perianth-segments triangular, subacute, tardily caducous. Fruit subglobose, ·25″ in diameter, smooth, shining, crowned with the truncate perianth-tube, apiculate.

N. Kanara district in monsoon and rain-forest growing on different trees. Fl. C. S.

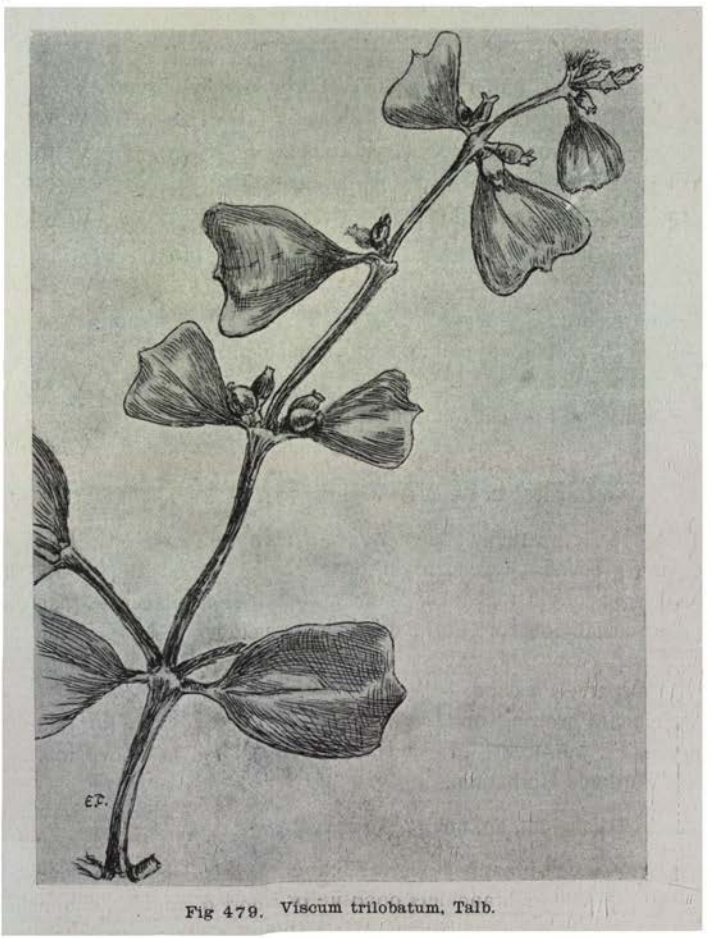

Fig 479. Viscum trilobatum, Talb.

3. V. orientale, Willd, Sp. Pl. 4, 737; Fl. Br. I. 5, 224; Trimen Fl. Ceyl. 3, 471; Cooke Fl. Pres. Bomb. 2, 55[2].

A large much branched shrub; stems terete or angled and grooved, thickened at the nodes; branchlets slender. Leaves ovate or elliptic-lanceolate, 1·25"-2" by ·5"-1", acute at the apex, tapering into an obscure petiole at the base, thinly coriaceous, glabrous; basal-nerves 3-5, distinct. Flowers on short, axillary peduncles, usually in clusters of 3 at the nodes; bracteoles connate. Perianth-lobes 3-4, triangular-acute. Ovary oblong, warted. Fruit ovoid, or subglobose, ·25" in diameter; albumen biconvex, green and firm; embryo minute, comma-shaped; radicle green, slightly thickened at the top. *V. monoicum,* Roxb. scarcely differs from *V. orientale* and should I think be united with it.

Bengal, Behar, Chittagong, Burmah and the Western peninsula from the Konkan to Travancore, Ceylon; throughout the Konkan and N. Kanara usually in rain-forest, often growing on *Terminalia paniculata,* and on *Loranthus capitellatus.* Fl. Sept.-Jan.

4. V. capitellatum, Sm. in Rees, Cyclop. 37, 18; Fl. Br. I. 5, 225; Cooke Fl. Pres. Bomb. 2, 552; Trimen Fl. Ceyl. 3, 471.

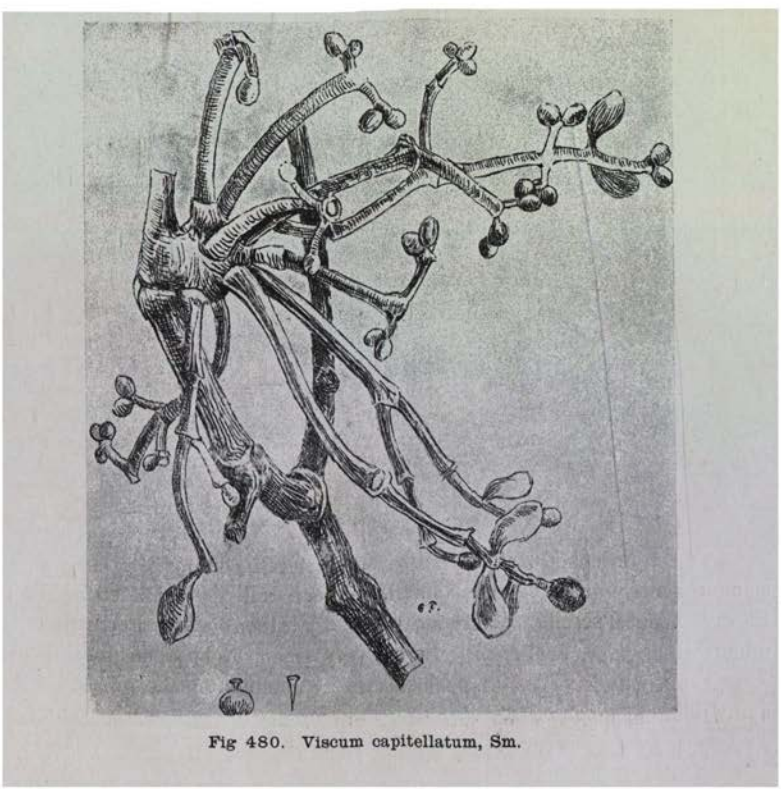

Fig 480. Viscum capitellatum, Sm.

A dwarf much branched shrub; branches tufted, angular or compressed, yellowish-green; branchlets short, opposite, horizontal. Leaves sessile, obovate-spathulate (often wanting), ·25″-·75″ long by nearly as broad, rounded, often bilobed at the apex, cuneate at the base, concave at the top; margins recurved, very thick and fleshy; nervation obscure. Flowers minute, sessile, in pairs or few-fascicled together on short, stout, divaricate, opposite or whorled peduncles; bracts rounded. Calyx-limb a fleshy ring. Perianth-segments 3, triangular, subacute, thick. Berry globose, ·25″ in diameter, white; albumen green, covered with an outside sticky layer; embryo minute with a globose radicle.

Western peninsula from the Konkan southwards, Ceylon; commonly parasitic on *Loranthus longiflorus* and other species of *Loranthus* in monsoon or rain-forest, also on *Terminalia paniculata*. Fl. C. S. Fr. Jan.-Feb. A very distinct species.

5. V. angulatum, Heyne in DC. Prodr. 4, 283; Fl. Br. I. 5, 225; Dalz. & Gibs. Bomb. Fl. 110; Cooke Fl. Pres. Bomb. 2, 553; *V. ramosissimum*, Wgt. Ic. t. 1018 (not of Wall.) *Jalunder*, Vern.

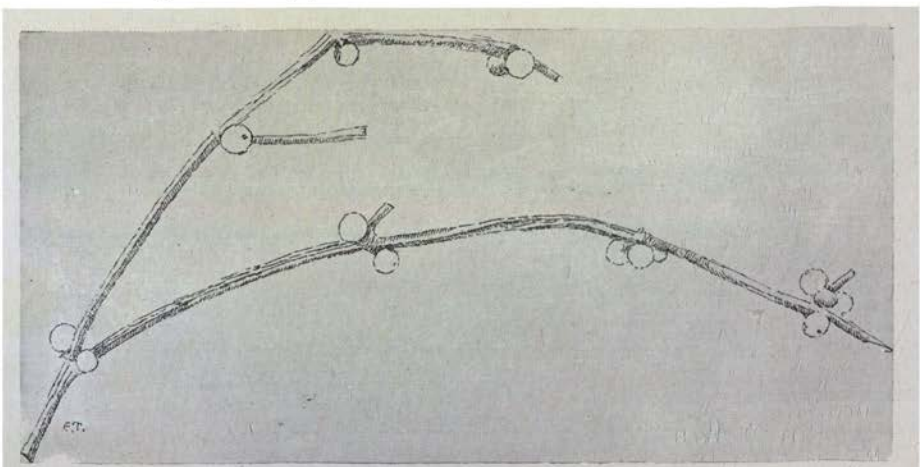

Fig 481. Viscum angulatum, Heyne.

A much branched leafless shrub; stems terete; branchlets very numerous, slender, acutely quadrangular, jointed, neither swollen nor jointed at the nodes. Flowers minute, sessile, solitary or whorled at the nodes. Perianth-lobes 3-4, minute, triangular, caducous. Berry very small, globose, in sessile clusters.

Java, Australia, Western peninsula; very common on the ghâts, growing on many different kinds of trees. Flowers apparently throughout the year.

6. V. articulatum, Burm. Fl. Ind. 311; Fl. Br. I. 5, 226; Cooke Fl. Pres. Bomb. 2, 553; Trimen Fl. Ceyl. 3, 472; *V. attenuatum,* DC. Prodr. 4, 284; Grah. Cat. Bomb. Pl. 85; Brandis For. Fl. 294. *Banda,* M.

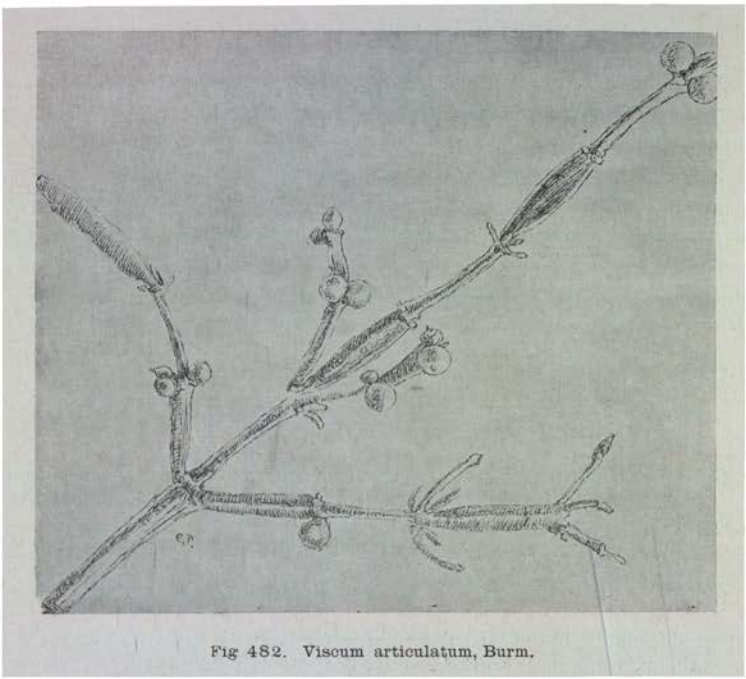

Fig 482. Viscum articulatum, Burm.

A leafless dichotomously branched shrub; stems 1′-2′ long; branches pendulous, with obtuse, linear, flattened, striate or furrowed internodes 1″-2″ long by ·1″-·25″ broad, contracted at the joints, pale-green, turning brownish-yellow when dry. Flowers minute, shortly peduncled, in 1-6-flowered fascicles at the nodes, each flower supported by a cup-shaped bract. Perianth-lobes triangular, caducous. Berry globose, ·15″ in diameter, smooth, greenish-yellow or white; seed lenticular covered with a sticky layer; embryo thick, linear, apparently solid.

Sub-tropical Himalaya from Chamba to Sikkim and southwards to Ceylon, Western peninsula, Konkan, in dense masses on *Randia dumentorum* and *Eugenia Jambolanum* near Mahableshwar; Dekkan, Southern Mahratta Country and N. Kanara in monsoon-forest on different kinds of trees not nearly so common as *V. angulatum.* Fl. June-Aug. Fr. Dec.-Feb.

Order LXXXI.—SANTALACEÆ.

Trees shrubs or herbs usually more or less parasitic on the roots of the host plant. Leaves entire, alternate or opposite; stipules O. Flowers small, regular, hermaphrodite or unisexual, in simple or compound cymes; bracts usually small, sometimes leafy; bracteoles 2, subopposite, free or connate, sometimes wanting. Perianth superior or inferior, 3-8-toothed, lobed or partite, often with a hairy tuft behind the anthers. Stamens 3-6, opposite to the perianth-lobes. Disk epigynous or perigynous. Ovary inferior, 1-celled with a free, central placenta bearing 2-3 pendulous ovules; style usually short; stigma entire or 3-6-lobed. Fruit a nut or drupe. Seed globose; albumen copious; embryo usually terete.

Unarmed trees or shrubs. Anther-cells parallel, distinct.		
Leaves opposite. Flowers hermaphrodite	... 1.	Santalum.
Leaves alternate. Flowers polygamous	... 2.	Osyris.
Spinous tree. Anther-cells divergent or confluent	3.	Scleropyrum.

1. SANTALUM, LINN.

Glabrous trees or shrubs. Leaves entire, coriaceous, usually opposite. Flowers hermaphrodite, in terminal and axillary cymes; bracts minute. Perianth-tube campanulate, adnate to the base of the ovary; lobes usually 4, valvate, with a tuft of hairs on the face. Stamens 4-5, short, adnate to the base of the perianth-lobes; filaments slender; anthers ovate with distinct parallel cells. Disk of fleshy, spathulate scales projecting between the stamens. Ovary at first free, at length half-inferior, 1-celled with 2-3 pendulous ovules attached near the base of the central placenta; style elongate; stigma 2-3-lobed. Drupe globose, fleshy, crowned with the annulate perianth. Seed globose; albumen copious; embryo small, terete.

S. album, Linn. Sp. Pl. 498; Fl. Br. I. 5, 231; Brandis For. Fl. 398; Bedd. Fl. Sylv. t. 256; Cooke Fl. Pres. Bomb. 2, 555; Gamble Ind. Timb. 585. *The White Sandalwood Tree*; *Chandan*, M.; *Gundada*, K.; *Sandal*, Hind.; *Suket*, Guz. *Sukhad*, Sind.

A small glabrous, evergreen tree; branches slender, drooping. Leaves ovate or elliptic-lanceolate, 1·5″-2·5″ by ·6″-1·25″, subacute at the apex, acute at the base, thin, glabrous shining above, pale beneath; lateral-nerves slender; petioles ·25″-·5″ long. Flowers inodorous, brownish-purple, in small, terminal or

lateral, cymose panicles; pedicels short usually in threes on the cyme-branches. Perianth campanulate with 4 triangular, valvate lobes. Stamens 4, exserted, adnate to the perianth-tube and alternating with 4, rounded, obtuse scales. Style as long as the perianth; stigma 4-lobed. Drupe globose, ·25″-·5″ in diameter, purple-black, succulent; endocarp bony, rough.

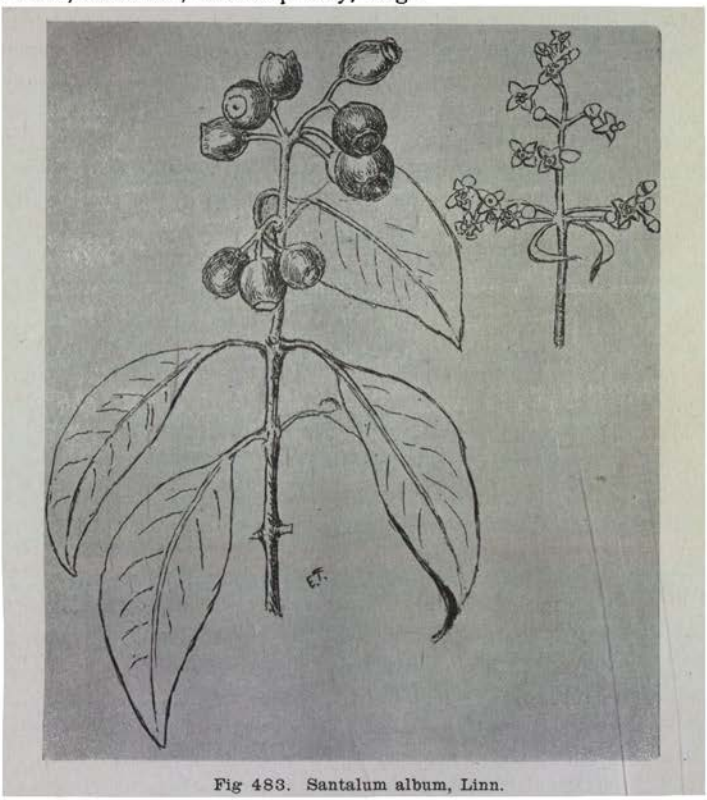

Fig 483. Santalum album, Linn.

Western peninsula from the Nasik district southwards to Mysore, common in the dry deciduous thorn and monsoon-forests of the Deccan, Southern Mahratta Country and N. Kanara, often found on the bunds of tanks and in or near hedges. Fl. Mch.-Aug. Fr. C. & H. S.

A small tree throughout the Deccan trap region where it rarely forms heartwood of marketable size. Many attempts have been made at sandalwood planting in the Northern and Central Bombay forest circles which have invariably been failures. I could only find one tree in the Hewra garden planted by Dr. Gibson more than 40 years ago which contained sandalwood. This piece measures 15′

in length by 4″ in diameter and is now in the Poona forest museum. The best and largest trees are in the Dharwar district and in N. Kanara along the Mysore border, growing on granitic or schistose rocky soils. The total annual yield of marketable sandalwood from the Bombay forests does not exceed 100 tons.

Bark dark-coloured, rough with short, vertical cracks ; inner-bark red. Sapwood white without any scent; heartwood yellowish-brown strongly scented, and close-grained. Annual-rings distinct. Pores small, circular, numerous. Medullary rays very fine and numerous. Weighs about 60 lbs. to the cub. ft. Used for carving, burning in Parsi temples and for the cremation of wealthy Hindoos. The seeds yield a thick viscid oil. An essential oil is also distilled from the wood; the roots yielding the greatest quantity. The peculiar spike disease from which the tree suffers in Mysore has not yet appeared in the Bombay forests.

2. OSYRIS, Linn.

Glabrous shrubs; branchlets acutely angular. Leaves alternate, entire. Flowers polygamous, (hermaphrodite and male); males cymose; hermaphrodite often solitary. Perianth-tube of male fl. solid; of hermaphrodite fl. adnate to the ovary; lobes 3-4, triangular, valvate with a small tuft of hairs on the upper face. Stamens 3-4, inserted at the base of perianth-tube; anther-cells distinct. Disk angled between the stamens. Ovary inferior; ovules 2-4 at the apex of the short, central placenta; style short. Fruit a globose drupe. Seed globose, albuminous; embryo terete or with the cotyledons dilated.

O. arborea, Wall. Cat. 4035; Fl. Br. I. 5, 232; Brandis For. Fl. 399; Cooke Fl. Pres. Bomb. 2, 555; Gamble Ind. Timb. 588; *O. Wightiana,* Dalz. & Gibs. Bomb. Fl. 223. *Popoli, lotal,* M. *Kuriganda, baingani,* K.

An evergreen shrub or small tree; branches virgate, triangular, glabrous. Leaves elliptic or obovate, 1″-1·5″ by ·5″-1″, obtuse and apiculate at the apex, obtuse at the base, coriaceous, pale-green, glabrous; petioles very short. Flower minute, yellowish. Male fl. ·15″ across, in long-peduncled, 5-10-flowered umbels; pedicels short. Perianth-lobes triangular acute with a tuft of hairs on the face. Stamens opposite the perianth-lobes. Disk fleshy, 3-lobed. Hermaphrodite fl. solitary or 2-3 together on slender, 2-bracteate peduncles which lengthen in fruit. Perianth superior, obconical. Stigma 3-lobed. Drupe subglobose, truncate, ·25″ in diameter, yellow.

Subtropical Himalaya up to 7000′, Upper Burmah, Central Provinces, Western peninsula, Ceylon; throughout the Konkan and N. Kanara in moist monsoon-forest from the coast inland also in dry deciduous forests, often growing on laterite. Fl. throughout the year. Bark dark-coloured, rough, fissured. Sapwood light-

red; heartwood dark-red, close-grained, smooth, hard and tough. Pores very small, numerous. Medullary rays very indistinct. Weighs about 54 lbs. to the cub. ft. Used for making walking sticks.

3. SCLEROPYRUM, Arn.

Tree with axillary spines. Leaves alternate, coriaceous. Flowers small, polygamous, in short, catkin-like, axillary spikes at the leafless nodes. Perianth-tube of the male fl. solid of the female fl. adnate to the ovary; lobes 5, valvate or subimbricate. Stamens 5 opposite the perianth-lobes; anther-cells dehiscing transversely. Disk annular. Ovary inferior; ovules 3, pendulous from the top of a central column; styles short; stigma large, peltate. Drupe large, pyriform, pedicelled. Seed globose; embryo terete.

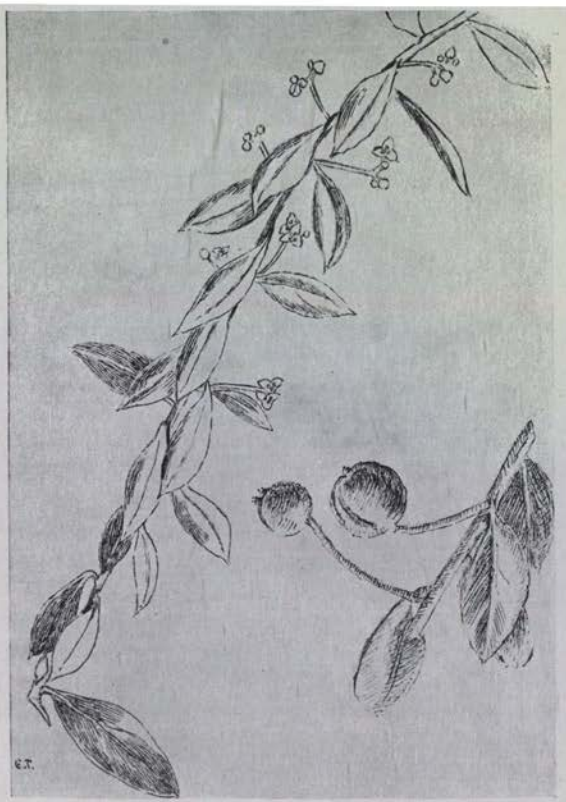

Fig 484. Osyris arborea, Wall.

S. Wallichianum, Arn. in Mag. Zool. & Bot. 2, 550 (1858); Fl. Br. I. 5, 234; Cooke Fl. Pres. Bomb. 2, 556; Gamble Ind. Timb. 588; *Pyrularia Wallichiana,* Bedd. Fl. Sylv. t. 304. *Bodliga,* K.

A small tree armed with conical, sharp, often fascicled spines; branches stout, cylindrical somewhat zigzag. Leaves ovate, 3″-6″ by 1·25″-2·25″, obtuse or subacute at the apex, subacute at the base, glabrous, red when young; lateral-nerves 3-5 pairs strong beneath; petioles very short and stout. Flowers polygamous, yellowish-red, nearly sessile. Male fl. in numerous, short, pubescent, axillary

(often from above the scars of fallen leaves) catkin-like spikes; bracts filiform, caducous. Perianth-tube solid; lobes slightly imbricate in bud, with tufts of hairs behind the stamens. Stamens 5; filaments bifid; anthers 10. Female fl. in cylindrical racemes. Perianth-tube adnate to the ovary. Stigma large, peltate. Drupe pear-shaped, shortly stalked, 2″ long, brown, crowned with the persistent perianth-lobes; seed globose, ·5″ in diameter; endocarp bony.

Western peninsula from the Konkan southwards, Ceylon, 4-6000′; Konkan and N. Kanara in rain-forest, common on the Southern ghâts. Fl. C. S. Fr. Apl.-June. Bark smooth, greyish-white. Wood whitish, very hard. Medullary rays numerous, fine and broad. Pith large.

Order LXXXII. EUPHORBIACEÆ.

Trees shrubs or herbs, often with milky juice. Leaves alternate or opposite, usually simple, rarely compound or divided; stipules usually small, caducous or persistent. Inflorescence various. Flowers always unisexual, usually small, often minute; sexes dissimilar. Perianth simple and calycine rarely double when it consists of a calyx and minute petals, sometimes absent in one or both sexes; disk usually present. Stamens 1, few or many; anthers 2-celled or 3-4-locellate. Ovary superior, 3 rarely 2, more or less united carpels; ovules 1-2 in each carpel, pendulous from the inner angle of the cell; funicle often thickened; styles as many as the carpels united below. Fruit a capsule or drupe of 3 on more dorsally dehiscing, 1-2-seeded cocci separating from a central axis or column or a more or less fleshy drupe. Seed with or without an arillus; albumen fleshy rarely O; embryo straight with flat cotyledons and a superior radicle or rarely exalbuminous with fleshy cotyledons.

A very large Natural Order next to the *Leguminosæ* in number of indigenous genera containing however few species of much interest to the Forester either as regards timber or other economic produce. The milky latex of the exotic trees *Hevea brasiliensis,* Muell. Arg. and *Manihot Glaziovii,* Muell. Arg. contains respectively the well known *Para* and *Ceara* rubbers. The climatic and soil conditions of parts of the N. Kanara district appear admirably suited for plantations of these commercially valuable species.

Flowers in heads containing numerous naked, pedicellate males surrounding one central, pedicellate, 3-celled female, all included in a perianth-like involucre.
Cells of ovary 1-ovuled .... 1. Euphorbia.

Flowers dicœcious or separate-moncœcious, neither united in heads nor enclosed in an involucre.
Cells of ovary 2-ovuled.
Petals minute or absent.
Petals minute. Calyx-lobes valvate.
Filaments united.
Ovary 2-celled. Fruit a drupe .... 2. Bridelia.
Ovary 3-celled. Fruit a capsule ... 3. Cleistanthus.
Filaments free. Calyx-lobes imbricate ... 4. Actephila.

Petals absent.
Stamens 3-6. Styles or their arms slender (except *Glochidion*).
Flowers monœcious.
Perianth of male flowers with 6, spreading lobes.
Disk present in both sexes ... ... 5. Phyllanthus.
Disk absent. Styles confluent .... 6. Glochidion.
Perianth of male flowers turbinate; lobes minute 7. Breynia.
Perianth of male flowers rotate, 6-lobed; lobes spurred ... ... 8. Sauropus.
Flowers dicœcious. Sepals 5 ... ... 9. Flueggia.
Stamens few or many. Styles or stigmas 2-3, dilated.
Leaves entire or serrulate. Fruit a drupe.
Stamens 2-3. Ovary 2-3-celled .... 10. Putranjiva.
Stamens 8 or more. Ovary 1-celled .... 11. Hemicyclia.
Stamens many. Ovary 2-4-celled .... 12. Cyclostemon.
Leaves trifoliate. Stamens 5 ... ... 13. Bischofia.
Stamens 2-8. Styles or stigmas minute.
Male flowers in catkins. Fruit dehiscent ... 14. Aporosa.
Male flowers in spikes or racemes. Fruit indehiscent ... . 15. Antidesma.

Cells of ovary 1-ovuled.
Male flowers petaliferous.
Inflorescence terminal.
Inflorescence of 2-3-chotomous, unisexual cymes ... ... 16. Jatropha.
Inflorescence of androgynous spikes or racemes 17. Croton.
Inflorescence of axillary spikes, racemes or panicles.
Calyx of male flowers imbricate.
Petals connate. Sepals not enlarged in fruit 18. Givotia.
Petals distinct. Sepals enlarged in fruit.
Petals present in the female flower ... 19. Blachia.
Petals absent in the female flower ... 20. Dimorphocalyx.
Calyx of male flowers valvate ... ... 21. Agrostistachys.
Flowers apetalous in both sexes.
Male sepals 4-6, imbricate, free ... ... 22. Baliospermum.

Male calyx closed in bud, membranous, splitting into 3-5 concave sepals.
Filaments distinct.
Anthers 2-celled.
Stamens 4; styles plumose ... ... 23. Adenochlæna.
Stamens numerous.
Anther-cells oblong. Capsule drupaceous ... 24. Trewia.
Anther-cells globose. Capsule dry ... 25. Mallotus.
Stamens 1, few or many; anthers 4-locellate.
Styles very long, filiform ... ... 26. Cleidion.
Styles short, recurved ... ... 27. Macaranga.
Filaments connate in bundles or branched.
Flowers diœcious, in axillary spikes ... ... 28. Homonoia.
Male calyx minute, open in bud, not enclosing the stamens.
Male calyx cupular, 2-3-lobed ... ... 29. Sapium.
Male calyx of 2-3 distinct sepals ... ... 30. Excœcaria.

1. EUPHORBIA, Linn.

Herbs, shrubs or small trees, often with much milky juice. Leaves of the stem alternate, with or without stipular spines or opposite and stipulate; leaves of the flowering branches opposite. Flowers monœcious, consisting of many male and one central female flower all enclosed in a perianth-like involucre; lobes with thick glands at the sinuses, glands often furnished with a petaloid wing. Male fl.: One naked stamen consisting of a 2-celled anther on an articulated filament. Female fl.: A stipitate, 3-celled ovary in the centre of the involucre; styles 3, free or combined, simple or bifid. Capsule of 3, 2-celled, 2-valved cocci separating elastically from a columella; cotyledons broad, flat.

Trees with thick fleshy branches armed at the nodes with twin, stipular spines.
Branches angled with 3-5, thick, sinuate wings ... 1. E. antiquorum.
Branches angular with 5, spirally twisted ribs ... 2. E. ligularia.
Branches subcylindric with twin, stipular spines on spirally arranged tubercles ... ... 3. E. neriifolia.

1. E. antiquorum, Linn. Sp. Pl. 450; Fl. Br. I. 5, 255; Dalz. & Gibs. Bomb. Fl. 226; Brandis For. Fl. 438; Bedd. Fl. Sylv. 217; Gamble Ind. Timb. 590; Cooke Fl. Pres. Bomb. 2, 563. *Narsej,* M.; *Tindari-send,* Belgaum.

A small tree with a thick short cylindric trunk; branches numerous, curving upwards, fleshy, green, jointed with 3-5 broad, sinuate wings, narrowed at the joints. Leaves small, ·25″-·5″ long, subsessile, obovate-oblong with a rounded tip, thick fleshy, glabrous shining, nerveless, soon dehiscent; stipular spines short, sharp, divaricate, persistent. Flower-heads yellowish, in shortly stalked cymes of 3; central head sessile, lateral on short, stout peduncles; bracts 2, obovate, opposite, conspicuous. Involucral-glands 5, broader than long, fleshy. Stamens numerous, mixed with laciniate bractlets. Capsule about ·5″ in diameter; cocci compressed; styles bifid.

Tropical India and Ceylon, rather rare in the Bombay presidency, Bijapore also Belgaum district and in several places on the N. Kanara ghâts, apparently planted, very common and gregarious in open thorn-forest in the Kadur district of Mysore and in hedges in the Madras Presidency (Coimbatore district). Fl. R. S. A distinct species with very rough corrugated, brown bark and white, soft, even-grained wood. The whole plant contains abundance of acrid, milky juice which hardens into a kind of *Gum-Euphorbium.*

2. E. ligularia, Roxb. Hort. Beng. (1814), 36; Buch.-Ham. in Trans. Linn. Soc. 14, 285 (exclud. syn.); Cooke Fl. Pres. Bomb. 2, 563; *E. neriifolia,* Fl. Br. I. 5, 255; Talb. Trees Bomb. 297; Dalz. & Gibs. Bomb. Fl. 226 (not of Linn.); *Ligularia lactea,* Rumph. Herb. Amboin. 4, 91, t. 40. *Thor, nivarung, sij, mingut,* Vern. *Yellikalli,* K.

A large shrub or small tree; stems 1′-2′ in diameter at the base; branches yellowish-green, thick, fleshy, glabrous, jointed; joints about 6″ long by 3″ in diameter, obtusely or acutely angled and more or less spirally twisted with 5 rows of saw-like, confluent tubercles 1″ apart, each crowned with 2 divaricate, sharp, black, stipular spines about ·3″ long. Leaves alternate, subterminal, early caducous, spathulately obovate, 4″-12″ by 1·5″-3″, acute or obtuse at the apex, tapering at the base, fleshy, light-green above, pale beneath; lateral-nerves indistinct; petioles very short. Flower-heads yellowish or red, hemispheric, in small, peduncled cymes 1-2 from the sinuses between the tubercles on the terminal joints of the branches; cyme-branches divaricate, often with one sessile, central male and 2 lateral, peduncled, bisexual heads; involucral-lobes large, erect, rounded, smooth often covered with a shining gum, sometimes the cyme-branches have 4 heads, the 3 lateral male and the central fertile; bracts opposite, reniform, small; glands transversely oblong. Male fl. 10-12; bracteoles numerous, laciniate, fimbriate; filaments articulated, red; anther-cells distinct; pollen bright-yellow. Female fl. on a recurved gynophore ·25″-·5″ long, triangular, 3-celled, red, flattened at the top; styles connate at the base usually undivided. Capsule deeply laterally 3-lobed, ·5″ broad; cocci compressed, glabrous.

Indigenous in the Western peninsula, cultivated as a hedge plant in Upper

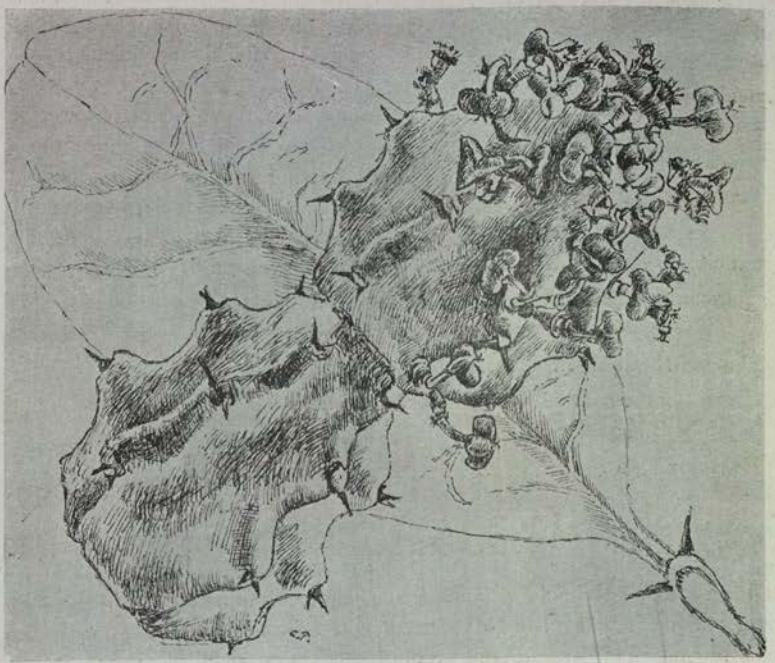

Fig 485. Euphorbia ligularia, Roxb.

and Lower Burmah, Central Provinces and Ceylon; throughout the dry Deccan, very common in open thorn-forest formation in the Poona, Satara and Nasik districts also on the ghâts under a heavy rainfall. Fl. Fr. Feb.-Apl. Young leaves appear in Apl.-May only in localities with a fairly abundant rainfall and in dry shady places. The old leaves drop off before September. A very variable species with respect to the arrangement of the different parts of the inflorescence. Dr. T. Cooke in his Fl. Bomb. Pres. 2, 563 has an excellent note on the naming of this common Deccan arborescent *Euphorbia* about which there has hitherto been much confusion.

3. E. neriifolia, Linn. Sp. Pl. 451; Cooke Fl. Pres. Bomb. 2, 564; *E. Nivulia*, Buch.-Ham. in Trans. Linn. Soc. 14, 286; Wight Ic. 1862; Dalz. & Gibs. Bomb. Fl. 285; Talb. Trees Bomb. 297; Bedd. Fl. Sylv. 216; Fl. Br. I. 5, 255; Gamble Ind. Timb. 590. *Newrang*, M.

A large fleshy shrub or small tree; branches cylindric with low, truncate, spirally arranged tubercles each crowned with a pair of short, divaricate, sharp

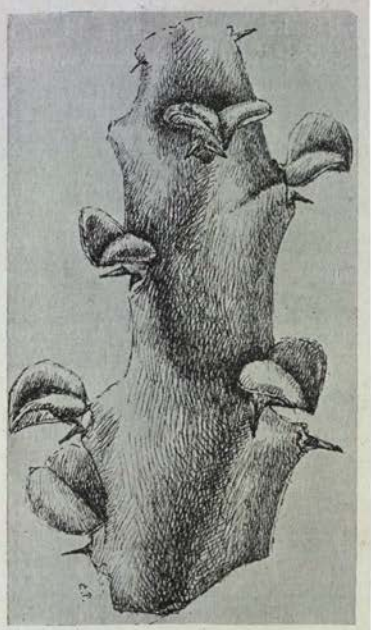

Fig 486. Euphorbia, sp.

stipulary spines. Leaves alternate, sessile, obovate, oblong or tongue-shaped, 4″-6″ by 1·25″-2″, rounded and apiculate at the apex, acute at the base, very fleshy, glabrous; nervation obscure. Flower-heads yellowish usually in threes above the leaf-scars forming solitary or twin, peduncled cymes; central head male, sessile; lateral bisexual, pedicellate; bracts conspicuous. Involucres hemispheric; lobes large, ovate, erect, fimbriate; glands transversely oval. Male fl. 40 in bundles of 5 (Dalz.). Ovary glabrous; styles connate half-way, undivided. Capsule deeply 3-lobed, ·25″ broad; lobes compressed; seeds smooth.

N. W. Himalaya, Pegu, Burmah and the Western peninsula, Guzerat and Sind common, often in hedges. Fl. March. Fr. Apl.-May. "The copious milky juice yields a kind of *Gum-Euphorbium*." Kurz. Fig. No. 486 represents a branch with leaves of a plant growing on rocky soil in the Ahmednagar and Bijapore districts which I take to be the above species.

E. Tirucalli, Linn. Hort. Cliff. 197; Fl. Br. I. 5, 254; Cooke Fl. Pres. Bomb. 2. 570; Brandis For. Fl. 439; Dalz. & Gibs. Bomb. Fl. Suppl. 76. *Milk-bush. Nevli, thuvar, seyr, tej, niwal*, M. *Yele-gulla*, K.

The common unarmed smooth *Milk-bush*, a native of Africa is naturalized throughout the dry districts of the presidency usually in hedges on black soil. Fl. Aug.-Sept. A small tree with numerous, green, cylindric, ascending leafless rush like branches. The stems rarely exceed 20′ in height and 12″ in diameter. Bark greenish-brown. Wood white or grey, moderately hard, strong and tough, not attacked by white ants. Used for rafters and for making toys. Cattle avoid this tree on account of its abundant acrid vesicant milky juice which however also contains rubber.

2. BRIDELIA, Willd.

Shrubs or trees. Leaves alternate, entire, with prominent, parallel, lateral-nerves. Flowers small or minute, monœcious or rarely dicœcious, dichlamydeous,

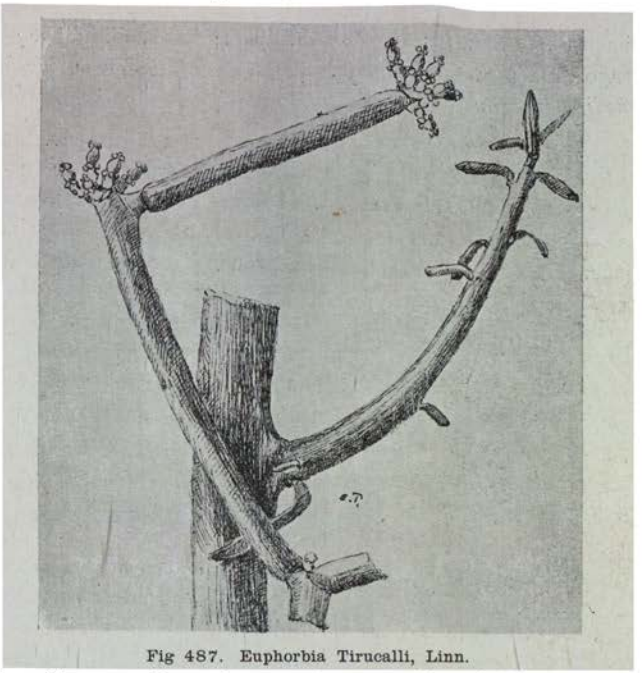

Fig 487. Euphorbia Tirucalli, Linn.

bracteate, in axillary or spikate clusters; bracts small, scale-like. Calyx 5-cleft, glabrous; lobes valvate. Petals 5, alternating with and smaller than the calyx-lobes. Male fl. numerous. Stamens 5, connate in a central column, distinct and spreading above, situated on a flat, conspicuous, sinuate disk which is adnate to the calyx; anthers ovoid, 2-celled. Female fl. solitary or few. Ovary 2-celled surrounded by a membranous cup-shaped or tubular disk variously lobed; ovarian cells each with 2 ovules; styles 2, bifid, connate at the base. Fruit a drupe with 1-2, 1-seeded cocci or pyrenes. Seed with a fleshy or membranous albumen; cotyledons thin or fleshy.

Flowers dicœcious.

An erect tree. Lateral-nerves of leaf 12-30 pairs 1. B. retusa.

Flowers monœcious.

A climbing shrub. Lateral-nerves of leaf 6-12 pairs. Drupe oblong ... ... 2. B. stipularis.

A straggling shrub. Lateral-nerves of leaf 6-9 pairs. Drupe globose ... ... 3. B. Hamiltoniana.

1. B. retusa, Spreng. Syst. Veg. 3, 48; Fl. Br. I. 5, 268; Brandis For. Fl. 449; Bedd. Fl. Sylv. t. 260; Cooke Fl. Pres. Bomb. 2, 572; Gamble Ind. Timb.

595; Trimen Fl. Ceyl. 4, 10; *B. montana*, Willd.; Roxb. Fl. Ind. 3, 735; Brandis For. Fl. 450; Dalz. & Gibs. Bomb. Fl. 233. *Mulla-honne, muljane, goojoo, phatterphodi, havu-gandha*, K. *Asana, kanta-kauchi, kutki*, M.

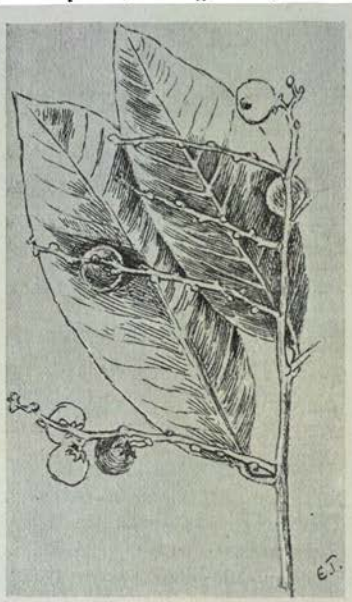

Fig 488. Bridelia retusa, Spreng.

A small or moderate-sized tree, spinous when young; branchlets rufous-pubescent. Leaves ovate or elliptic-oblong, 3"-7" by 1·5"-4·5", obtuse, rounded or acute at the apex, rounded or subacute at the base, margins entire or shallow-crenate, coriaceous, glabrous, light-green shining above, pale with whitish-pubescence or glabrous and glaucous beneath; lateral-nerves numerous up to 30 pairs, parallel and strong beneath with fine, reticulate venation between; petioles ·25"-·5" long, pubescent; stipules lanceolate, acuminate, oblique at the base, deciduous. Flowers dioecious, greenish-yellow, sessile or on very short pedicels, in dense, axillary clusters or on axillary or terminal sometimes paniculate spikes; bracts ovate, acute, deciduous. Male fl. ·15" across. Calyx-lobes triangular acute, spreading. Petals much smaller, pectinate. Disk thick, pulpy. Female fl. smaller than the male. Calyx as in the male. Petals spathulate, not pectinate, persistent. Disk truncate enclosing the ovary, laciniate at the top; styles short. Fruit globose, ·25" in diameter seated on the persistent calyx and petals, purplish-black, succulent; cocci dehiscent.

Hotter parts of India, along the base of the Himalaya from Kashmir to Mishmi and southwards to Ceylon, throughout the presidency in deciduous monsoon-forest. Fl. Apl.-Oct. Fr. May-June. Loses its leaves in March-Apl. Young trees with long, sharp spines which fall off later on. Both the varieties *Roxburghiana* and *glauca* are found in the Konkan and N. Kanara. Bark grey, rough, scaly; inner-bark reddish, fibrous. Sapwood pale yellowish-white; heartwood grey or olive-brown, close-grained, durable and seasons well, moderately hard, with the grain silvery mottled, takes a fine polish. Pores numerous, moderate-sized, in short, radial groups or rows. Medullary rays numerous, moderately broad, short and equidistant. Weighs 48 lbs. to the cub. ft. Used for agricultural implements, building purposes, carts etc. A durable timber which stands well under water. The very astringent bark is used for tanning. The fruit is edible.

2. B. stipularis, Blume Bijdr. 597; Fl. Br. I. 5, 270; Brandis For. Fl. 449; Bedd. Fl. Sylv. 201; Cooke Fl. Pres. Bomb. 5, 573; Gamble Ind. Timb. 596. *Bisal-balli, bislu-hannu, phater-phod, akshatta-balli,* K.

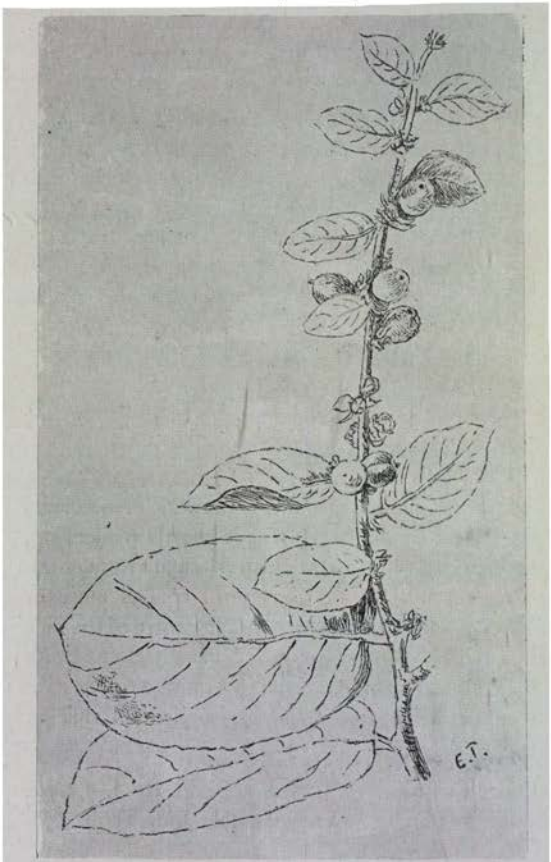

Fig 489. Bridelia stipularis, Blume.

A large scandent or straggling shrub; branches fluted, often with large, deflexed spines; branchlets slender, rusty-pubescent. Leaves elliptic or obovate, 1″-4″ by ·5″-2″, obtuse or acute at the apex, rounded or subcordate at the base; margins shallowly crenate or entire, thinly coriaceous, glabrescent above, more or less pale, grey-pubescent beneath; lateral-nerves 6-12 pairs, arching upwards, prominent; veins parallel and at right-angles to the nerves, slender, distinct. Flowers monœcious, small, greenish-yellow, sessile or the female shortly pedicelled, crowded in dense, axillary, somewhat distinct heads arranged in paniculate, leafy spikes; bracts stipule-like, lanceolate acute, ·12″ long, rusty-tomentose. Calyx hairy outside, ·2″ long; lobes triangular acuminate, persistent and enlarged in fruit. Petals suborbicular, crenulate, shortly clawed, shorter than the calyx-lobes. Staminal-column ·12″ long. Styles 2, bifid; arms slender. Drupe ovoid, ·2″ long, bluish-black, succulent, smooth, seated on the enlarged calyx.

Hotter parts of India from the Himalaya to Ceylon; common in monsoon-forest throughout the presidency. Fl. and Fr. May-Nov. A large climber. Stems 2″-8″ in diameter; branches often develop aerial roots. Bark grey, ·75″ thick, hard, deeply fissured; inner-bark consisting of reddish-brown, thin plates. Sapwood

white; heartwood greyish-brown, moderately hard with fine, concentric, transverse bars. Annual-rings distinct. Pores moderate-sized in short lines between the prominent, fine medullary rays. Weighs 60 lbs. to the cub. ft. The fruit yields a black colouring matter.

3. B. Hamiltoniana, Wall. Cat. 7882; Fl. Br. I. 5, 271; Bedd. Fl. Sylv. 202; Cooke Fl. Pres. Bomb. 2, 573; Gamble Ind. Timb. 595.

A straggling nearly glabrous shrub. Leaves obovate-oblong or rhombic-lanceolate, 1·5″-3·5″ by ·75″-1·75″, obtuse at the apex, narrowed into the petiole at the base, margins repand or shallowly crenate, glabrescent beneath; lateral-nerves 5-9 pairs nearly straight parallel with reticulate venation between; petioles ·25″ long. Flowers glabrous, in small axillary, spikate clusters. Calyx ·12″ long, glabrous; lobes triangular-ovate, connate below. Petals of male rounded, those of the female ovate. Styles 2, distinct, shortly bifid. Drupe globose, ·25″ in diameter, black, seated on the unaltered calyx.

Western peninsula on the Konkan ghâts, Guzerat, Behar. Fl. Aug.-Nov. Closely allied to *B. stipularis.*

3. CLEISTANTHUS, Hook, f.

Trees or shrubs. Leaves alternate, bifarious, entire. Flowers monœcious, small, in axillary clusters or short spikes, sessile or the female shortly pedicellate. Calyx-lobes 5, valvate in bud, shorter in the female and deeply cupular under the ovary. Petals 5, minute. Disk of the male flat of the female conical more or less enclosing the ovary. Stamens 5, united in a column in the centre of the disk which is crowned with the small pistillode. Ovary 3-4-celled, usually clothed with long hairs; ovules 2 in each cell; styles 3, bifid. Fruit a stipitate or sessile, 3-celled, 6-valved capsule. Seeds exarillate, albuminous; cotyledons thin or fleshy, often folded.

C. malabaricus, Muell. Arg. in DC. Prodr. 15, part 2, 508; Fl. Br. I. 5, 276; Bedd. Fl. Sylv. 203; Cooke Fl. Pres. Bomb. 2, 574; Gamble Ind. Timb. 597. *Hole-hutige,* K.

A large shrub or small tree; branches terete, brown, glabrous, lenticellate; branchlets densely rufous-hairy. Leaves obovate or oblanceolate, 2″-7″ by ·75″-2″, acute or acuminate at the apex, narrowed into the petiole at the base, thin or subcoriaceous, sparsely hairy above, more or less densely grey-pubescent or glaucous beneath; lateral-nerves about 8 pairs, prominent beneath; petioles ·1″-·2″ long, hairy; stipules linear-setaceous, ·5″ long, rufous-hairy, persistent. Flowers few, usually 2-3 sessile males and one shortly pedicelled female, in axillary clusters; bracts ovate, scarious, hairy. Calyx ·25″ long, glabrous; lobes triangular-

acuminate, connate below. Petals spathulate, clawed, shorter than the calyx-lobes. Ovary surrounded with long stiff white hairs. Drupe subglobose, ·25″ in diameter, obtusely 3-4-angled and deeply 3-4 lobed at the top, fulvous-hairy when young ultimately brown, glabrous shining, crowned with the remains of the styles and seated on the slightly enlarged calyx; seeds 3-angled, rugose.

Western peninsula, Konkan and N. Kanara in rain-forest usually near streams and rivers, common on the river-banks above the falls of Gairsoppah. Fl. Nov.-Dec. Fr. Jan.-Feb.

4. ACTEPHILA, Blume.

Trees or shrubs. Leaves large, alternate, entire. Flowers monœcious or occasionally dioecious, in axillary clusters. Male fl. shortly pedicellate. Sepals 5-6, imbricate. Petals 5, scale-like, inserted under the 5-lobed disk or O. Stamens 3-6, inserted on the disk; filaments free, anther-cells parallel. Pistillode 3-cleft. Female fl. long-pedicellate. Perianth of the male. Ovary 3-celled, sessile on the 5-lobed disk; ovules 2 in each cell; styles free or connate at the base, entire or bifid. Capsule long-peduncled, 3-lobed, hard, loculicidally dehiscent. Seeds solitary in the cocci, large, 3-angled; testa thin, brittle; albumen scanty or O; cotyledons fleshy, folded or crumpled together.

A. excelsa, Muell. Arg. in Linnæa, 32, 78; Fl. Br. I. 5, 282; Bedd. Fl. Sylv. 189; Cooke Fl. Pres. Bomb. 2, 575; Gamble Ind. Timb. 598; *Amomospermum excelsum*, Dalz. in Kew Jour. Bot. 3, 288; Dalz, & Gibs. Bomb. Fl. 233; *A. neilgherrensis*, Wight Ic. 1910; Trimen Fl. Ceyl. 4, 14.

A shrub or small tree; young parts glabrous. Leaves elliptic or obovate, 3″-7″ by 1·5″-3″, acute or caudate-acuminate at the apex, acute at the base, coriaceous, glabrous; lateral-nerves 8-12 pairs, slender; petioles ·5″-·75″ long; stipules small, deciduous. Flowers small in small, axillary clusters, male on short, female on pedicels ·75″-1·5″ long; bracts short, hairy. Calyx-lobes broad-ovate, obtuse. Petals obovate often notched or bifid, cuneate. Disk lobed, yellow. Ovary globose, 3-celled; styles short, divaricate, bifid. Capsules depressed-globose, 1″-1·25″ long, 3-lobed, dark-green, seated on the persistent calyx and petals; pedicels slightly thickened upwards; seeds obtusely trigonous, ·5″ long, brown.

Hills of India, Burmah, Andamans, Java, Ceylon up to 6000′; Western peninsula on the Konkan and N. Kanara ghâts in rain-forest. A rare species in the Bombay presidency. Fl. Aug.-Sept.

5. PHYLLANTHUS, Linn.

Trees, shrubs or herbs. Leaves usually small, entire, stipulate, usually distichous; petioles short. Flowers small, monœcious or dicœcious, apetalous. Male fl.: Calyx-lobes usually 5-6, imbricate in 2 series. Stamens 3-5; filaments free or connate; anther-cells parallel or divergent with parallel or transverse dehiscence. Pistillode usually O. Disk of distinct glands alternating with the calyx-lobes. Female fl.: Sepals of the male. Ovary 3 or more celled; ovules 2 in each cell; styles freeor connate usually bifid. Fruit of 3 dehiscent cocci; epicarp sometimes fleshy. Seeds trigonous without an arillus or strophiole.

Flowers monœcious. Sepals 5-6 in both sexes.
A large scandent shrub. Fruit a small, globose, black berry ... ... 1. P. reticulatus.
A bushy, gregarious shrub. Fruit a small, crustaceous capsule ... ... 2. P. Lawii.
A tree. Fruit large, globose, fleshy with 3 bony, 2-celled cocci ... . 3. P. Emblica.
Flowers dicœcious. Sepals 4 in both sexes.
Fruit a small capsule ... ... 4. P. indicus.

1. P. reticulatus, Poir. Encycl. 5, 298; Fl. Br. I. 5, 288; Brandis For. Fl. 453; Bedd. Fl. Sylv. 190; Gamble Ind. Timb. 598; Cooke Fl. Pres. Bomb. 2, 585; *P. multiflorus*, Willd. Sp. Pl. 4, 581; Grah. Cat. Bomb. Pl. 180; *Anisonema multiflorum*, Wight Ic. t. 1899; Dalz. & Gibs. Bomb. Fl. 235. *Pavan*, M. *Datwan*, Guz. *Hooli-balli*, K. *Kaili*, Kon.

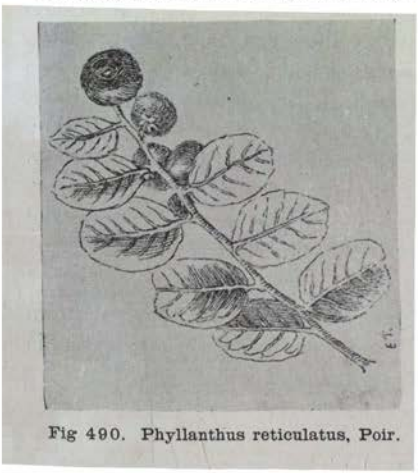

Fig 490. Phyllanthus reticulatus, Poir.

A large climbing shrub; branches glabrous, lenticellate; branchlets slender, drooping, more or less grey-tomentose. Leaves elliptic or obovate, ·5″-1·5″ by ·25″-·75,″ subacute at the apex, rounded or subcordate at the base, thin, glabrescent, dark-green above, paler beneath; lateral-nerves slender about 6 pairs united by a distinct, reticulate venation; petioles ·1″ long; stipules minute. Flowers slender-pedicelled, in axillary fascicles. Male fl. 3-6 along with 1-2 female. Calyx-lobes ovate, ·1″ long, membranous, alternating with the 5 disk-

glands. Male fl.: Stamens 5; 3 inner larger on thick filaments connate into a central column, the two outer short, free. Female fl.: Ovary globose, 5-12-celled; ovules 2 in each cell, superposed; styles short, minutely 2-lobed. Fruit globose, ·25″ in diameter, purple-black, smooth shining; seeds 8-16, bluntly trigonous, finely granulate.

Tropical India, Burmah and Ceylon; throughout the presidency and Sind in monsoon and thorn-forest usually in hedges. Flowers throughout the year. Bark brown, thin. Wood dark-grey, smooth, hard and compact. Annual-rings distinct. Pores small in the annual-ring otherwise very small and scanty. Medullary rays fine, uniform, wavy. Weighs 48 lbs. to the cub. ft. The fruit has a sweet taste. The leaves and bark are used in native medicine as a diuretic.

2. P. Lawii, Grah. Cat. Bomb. Pl. 181; Fl. Br. I. 5, 290; Gamble Ind. Timb. 600; Cooke Fl. Pres. Bomb. 2, 599; *P. polyphyllus*, Dalz. & Gibs. Bomb. Fl. 234 (not of Willd.); *P. juniperinoides*, Muell. Arg. in Linnæa 32, 18. *Kati* or *khad-sherni*, M.

A glabrous bushy shrub growing gregariously along river banks; branchlets angular, grooved often fascicled along the branches with 2 blunt, stipular-like emergences in the axils. Leaves distichous, overlapping, linear-oblong, ·12″-·2″ by ·08″-·1″, acute or subobtuse often apiculate at the apex, rounded or subcordate at the base; nervation obscure; petioles very short; stipules minute, subulate. Flowers few-fascicled in the axils of the upper leaves. Sepals of male and female flowers 6, linear-oblong, obtuse. Stamens 3; filaments united in a short column; anthers erect with vertical slits. Styles 3, distinct. Fruit globose like a grain of No. 4 shot, 3-lobed, 6-celled, breaking up from the apex; seeds triangular, glabrous.

Western peninsula forming dense thickets along the banks of rivers in the Konkan, Deccan and N. Kanara. Fl. Sept.-Oct. Fr. Nov. The branches are used in the Deccan for making large grain baskets.

3. P. Emblica, Linn. Sp. Pl. 982; Fl Br. I. 5, 289; Brandis For. Fl. 454; Bedd. Fl. Sylv. t. 258; Cooke Fl. Pres. Bomb. 2, 585; Gamble Ind. Timb. 599; *Emblica officinalis*, Gærtn. Fruct. 2, 122; Dalz. & Gibs. Bomb. Fl. 235. *The Emblic Myrobalan Tree. Awla, avala*, M. *Nelli-mara*, K. *Bhoza, amali, amla, ambala*, Guz.

A small or medium-sized deciduous tree; branches terete, glabrous or finely pubescent. Leaves distichous, imbricate when young having the appearance of a pinnate leaf, linear, ·25″-·5″ by ·1″-·12″, acute and apiculate at the apex, rounded at the base, pale beneath, deciduous; petioles very short; stipules minute, ovate, acute. Flowers small, yellowish, in dense, axillary fascicles or on the branches below the leaves; bracts small, fimbriate. Male. fl.: numerous on short, slender

pedicels. Calyx-lobes 6, oblong, obtuse. Disk of 6, minute glands. Stamens 6; filaments united in a short, central column; anthers extrorse. Female fl. few, sessile. Sepals as in the male. Ovary 3-celled, half immersed in the laciniate, cup-shaped disk; styles connate at the base; stigmas 3, bilobed; lobes dilated, recurved. Fruit depressed-globose, ·75" in diameter, yellow, smooth, fleshy, with 6, longitudinal, faint lines; endocarp of 3 triangular cocci, bony, dehiscent, with 3 short bundles of vascular tissue at the base in the yellow, fleshy pericarp, 6-seeded; seeds trigonous.

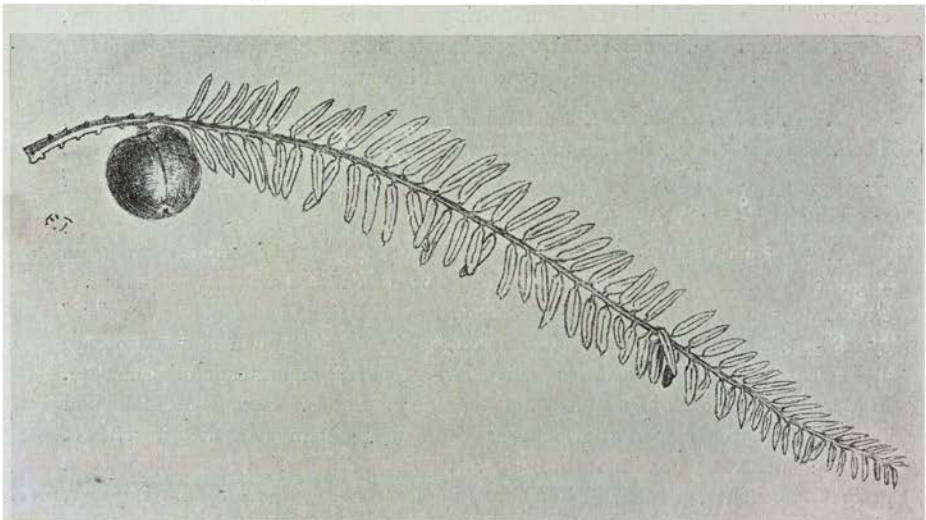

Fig 491. Phyllanthus Emblica, Linn.

Deciduous forests of tropical India, Burmah, Ceylon and the Indian Archipelago, sometimes planted; throughout the presidency in monsoon-forest. Fl. Mch.-May. Fr. Oct.-Feb. Usually a small tree. Bark thick, grey, exfoliating in small, irregular-shaped patches. Wood dark-red, hard, close-grained and mottled, no heartwood, flexible and tough but warps in seasoning. Annual-rings indistinct. Pores small often subdivided. Medullary rays moderately broad, separated by the breadth of one pore, prominent on a radial section. Weighs 54 lbs. to the cub. ft. Used for building purposes, well-work, furniture, gun-stocks and is adapted for turnery; yields a good fuel. The astringent fruit is much employed in native medicine also for dyeing and tanning. A useful coppice tree; branches much lopped for leaf-manure in parts of the Deccan.

4. P. indicus, Muell. Arg. in Linnæa 32, 52; Fl. Br. I. 5, 305; Bedd. Fl. Sylv. 191; Gamble Ind. Timb. 601; Cooke Fl. Pres. Bomb. 2, 588; Trimen Fl.

Ceyl. 4, 27; *Prosurus indica*, Dalz. in Kew Jour. Bot. 4, 346; Dalz. & Gibs. Bomb. Fl. 236. *Pan-nana, Kali-kudai.* K.

A moderate-sized glabrous deciduous tree with very characteristic, smooth, scaly bark. Leaves elliptic, 2·5″-6″ by 1·5″-3″, acute or acuminate at the apex, acute at the base, thin membranous, dark-green, shining above, glaucous beneath; lateral-nerves 6-10 pairs, slender; petioles ·25″-·5″ long; stipules small, linear. Flowers dicœcious, small, greenish, axillary, fascicled or on the branches below the leaves; bracts small, ovate, caducous. Sepals 4, oblong, the 2 outer largest. Male fl.: smaller than the female. Stamens 4; filaments free; anthers oblong, extrorse, longitudinally dehiscent. Disk fleshy, annular. Pistillode 0. Female fl.: Disk flat, narrow. Ovary 3-celled; ovules 2 in each cell; styles short, bifid; lobes deflexed. Capsule slightly depressed, globose, ·25″ in diameter, brown, crustaceous, reticulately rugose; cocci 2-valved, 2-seeded; seeds trigonous, blue, arillate.

Western peninsula, Ceylon, Konkan and N. Kanara ghâts in monsoon and rain-forest, rather a rare tree. Fl. Apl. Fr. May-June. Bark white, smooth, exfoliating in irregular plates disclosing patches covered with brown, thick lines; inner-bark with brown, regular bands of fibrous tissue; green parenchyma developed. Wood reddish-white, tough, hard, smooth and compact. Annual-rings distinct. Pores small, equally distributed. Medullary rays fine, white, wavy. Weighs 54 lbs. to the cub. ft. Used for building purposes in the Belgaum district.

5. *P. distichus*, Muell. Arg. in DC. Prodr. 15, 2, 413; Bedd. Fl. Sylv. 191; Cooke Fl. Pres. Bomb. 2, 589; *Cicca disticha*, Dalz. & Gibs. Bomb. Fl. Suppl. 78. *The Country Gooseberry. Harparawri, raiavala*, Vern. *Cherambola*, Goa.

A moderate-sized deciduous tree native of the Malay Archipelago and Madagascar, often cultivated in the Deccan and Konkan. Leaves pinnately distichous, obliquely ovate, 2″-3″ long. Flowers small, reddish, axillary, densely fascicled. Fruit globose, 1″ in diameter, ribbed, fleshy and acid. The fruit is eaten either raw or cooked and is also sometimes pickled. The bark is used for tanning in Southern India.

6. GLOCHIDION, Forst.

Trees or shrubs. Leaves alternate, bifarious, entire. Flowers small, in axillary clusters, usually monœcious, apetalous. Disk-glands absent. Male fl.: Sepals 6 in 2 series, imbricate. Stamens connate in an oblong or ellipsoid column; anthers 3-8 (sometimes more); cells linear, extrose; connectives produced into separate points or connate into an umbonate head. Pistillode 0 or very minute. Female fl.: Calyx of 6, short, imbricate sepals. Ovary 3-15-celled; ovules 2 in

each cell; styles connate in a globose, conical or subclavate column, lobed or toothed at the top usually lengthening during or after flowering. Capsule of 3 or more 2-valved cocci. Seeds albuminous; cotyledons flat.

Differs from *Phyllanthus* in the total absence of a disk and the peculiar modification of the styles.

Stamens 5-7. Calyx of ♀ with 5-6 distinct sepals.
  Style conical.
    Leaves beneath, flowers and capsules softly grey-pubescent ... ... 1. G. tomentosum.
    Leaves beneath, flowers and capsules quite glabrous ... ... 2. G. zeylanicum, var. nitidum.
Stamens 3. Calyx of ♀ irregularly 4-6-lobed or toothed.
  Style globose, sub-globose or columnar.
    Style globose or subglobose.
      Calyx glabrous. Capsule much depressed, 6-8-lobed ... ... 3. G. Hohenackeri.
      Calyx pubescent. Capsule obtusely trigonous, 6-lobed ... ... 4. G. Johnstonei.
    Style columnar with 4-6 obtuse lobes at the top ... ... 5. G. arboreum.
Stamens 3. Calyx of ♀ with 6 free sepals.
  Style minute glabrous.
    Female flowers pedicellate; branchlets pubescent ... ... 6. G. velutinum.
    Female flowers subsessile; branchlets glabrous.
      Style very minute, conical. Stipules subulate ... ... 7. G. malabaricum.
      Style short, stout, conical. Stipules hastate or falcate ... ... 8. G. ellipticum.

1. G. tomentosum, Dalz. in Hook, Jour. Bot. 3, 38; Fl. Br. I. 5, 309; Cooke Fl. Pres. Bomb. 2, 577; Bedd. Fl. Sylv. 192. *Niru-chelle*, K.

A large shrub or small tree; branchlets grooved and angled, finely grey-pubescent. Leaves ovate-oblong, 2″-7″ by 1″-3·5″, often unequal-sided, acute or acuminate at the apex, rounded or subcordate at the base, thinly coriaceous, glabrous shining above, pale bluish-grey, pubescent beneath; lateral-nerves 6-8 pairs, slender; petioles ·1″-·2″ long; stipules small, ovate acute. Flowers pedicelled, axillary, fascicled; males few; pedicels ·1″-·25″ long, thickened upwards, deflexed, pubescent. Male fl.: Sepals thick, unequal; 3 outer broader than the inner, pubescent; inner glabrous. Anthers 5-7; connectives acute. Female fl.: Perianth

of the male. Ovary globose, 5-celled, sulcate, tomentose; style stout, 4-5-cleft at the tip, tomentose. Capsule globose or depressed-globose; top intruded or not, ·5″ in diameter, obtusely 10-12-lobed, crowned with the small, conical style; seeds triangular, pale-red.

Western peninsula, endemic in the Konkan and N. Kanara, usually along nallahs in monsoon and rain-forest, rather a rare species closely allied to *G. zeylanicum*. Fl. Nov.-Dec. Fr. Jan.

2. G. zeylanicum, A. Juss. Tent. Euphorb. 107, t. 3. Var. *nitidum,* Hook. f.; Fl. Br. I. 5, 311; Cooke Fl. Pres. Bomb. 2, 578; *G. nitidum,* Dalz. & Gibs. Bomb. Fl. 235; Bedd. Fl. Sylv. 192. *Savre-gidda,* K.

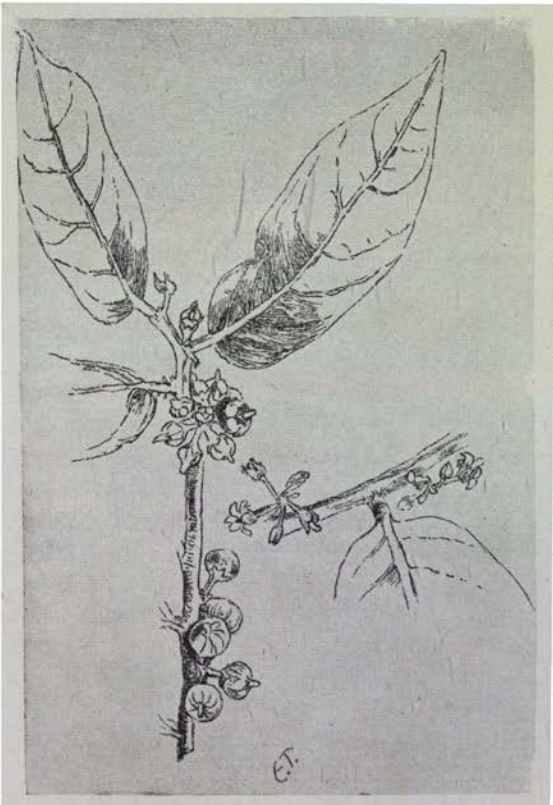

Fig 492. Glochidion zeylanicum, A. Juss.

A small tree; branches angled, grooved, flexuous, glabrous or pubescent. Leaves elliptic or ovate-oblong, 3·5″-8″ by 1·5″-4″, obtuse, acute or shortly acuminate at the apex, rounded or subcordate at the base, unequal-sided, coriaceous, glabrous, bright-green shining above, pale beneath; lateral-nerves 6-9 pairs, slender, distinct; petioles ·1″-·25″ long, stout; stipules triangular, acute. Flowers in short-peduncled, umbellate, supra-axillary clusters, mostly female; pedicels of different lengths up to ·25″ long, somewhat deflexed, male longer than the female. Sepals 5-6, ovate obtuse, thick, glabrous, similar in the 2 sexes. Anthers 5-6; connectives connate. Ovary 4-7-celled; cells each with 2 ovules; style shortly conical, 4-7-toothed at the top. Capsule globose, scarcely depressed, ·5″ in diameter, crowned with the short, conical style-lobes, marked in the young fruit with green, longitudinal lines; seeds triangular, red.

Western peninsula, from the Konkan southwards, Assam, Silhet, Malay peninsula, Ceylon; common on the Konkan and N. Kanara ghâts along streams and water channels both in rain and monsoon-forest. Fl. & Fr. throughout the year usually from Dec.-June. A small tree; stems about 1′ in diameter. Bark thin, grey, corky, rough with numerous, narrow fissures; inner-bark reddish containing numerous thread-like fibres. Wood dull-red, smooth, moderately hard and even-grained. Annual-rings visible. Pores small, equally distributed. Medullary rays moderately broad. Weighs 42 lbs. to the cub. ft.

3. G. Hohenackeri, Bedd. Fl. Sylv. (For. Man. 193); Fl. Br. I. 5, 314; Cooke Fl. Pres. Bomb. 2, 579; *G. lanceolarium,* Dalz. in Dalz. & Gibs. Bomb. Fl. 235.

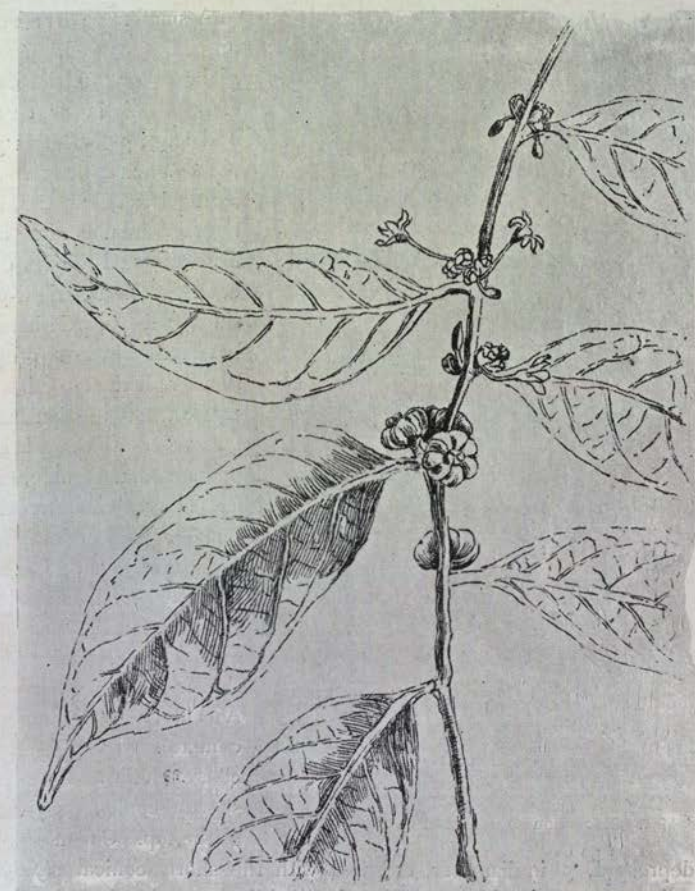

Fig 493. Glochidion Hohenackeri, Bedd.

(not of Voigt); *G. Ralphii*, Hook, f.; Fl. Br. I. 5, 314; *Bridelia sinica*, Grah. Cat. Bomb. Pl. 184. *Bhoma*, M. *Nirchelli*, *sullai*, K.

A small or middle-sized quite glabrous tree; branchlets terete. Leaves variable, elliptic-lanceolate, 3″-7″ by 1″-2·25″, acute or acuminate at the apex, usually acute at the base, more or less unequal-sided, thinly coriaceous; lateral-nerves 6-10 pairs, slender, distinct; petioles short, stout; stipules obliquely triangular, acute. Flowers yellow, usually dioecious, in axillary fascicles, male numerous on slender pedicels up to ·5″ long, female few, sessile or nearly so. Male fl.: Calyx deeply divided; lobes fleshy, oblong, rounded. Anthers 3; connectives not connate. Female fl.: Calyx cup-shaped, irregularly 4-6-toothed. Ovary glabrous; style depressed-globose, 3-4-furrowed at the top, broader than the ovary. Capsule nearly sessile, very depressed-globose and more or less deeply 4-6-lobed, intruded at the apex, crowned with the subglobose style; seeds angular, red, smooth, shining.

Western peninsula, very common on the Konkan and N. Kanara ghàts, usually in rain-forest, abundant at Mahableshwar and generally throughout the moist evergreen formations. Fl. Dec.-Apl. Fr. Apl.-June.

Bark dark-brown, thin, exfoliating in large flakes with short, longitudinal fissures. Wood red, darker coloured near the centre of tree. Annual-rings somewhat indistinct. Pores small, simple or divided, in radial lines between the fine or moderately broad medullary rays. Weighs about 50 lbs. to the cub. ft. Only used for fuel at Mahableshwar where the tree is one of the principal species growing on the laterite plateau. Monstrous male flowers consisting of a thick turbinate body crowned with obtuse, short perianth-lobes, on thickened pedicels are frequently found on this tree.

Dr. T. Cooke has clearly shown in his Flora Pres. Bomb. 2, 577 that this very common species is the *G. lanceolarium* of Dalzell. I have consequently excluded *G. lanceolarium* from the present work. I am also of opinion that *G. Ralphii*, Hook, f. cannot be satisfactorily separated from *G. Hohenackeri*, Bedd.

4. G. Johnstonei, Hook, f.; Fl. Br. I. 5, 314; Cooke Fl. Pres. Bomb. 2, 580; Brandis Ind. Trees. 575.

A small or medium-sized deciduous tree; branches angled lenticellate; branchlets grey-pubescent. Leaves bifarious, ovate-oblong or elliptic, 1·5″-3″ by ·5″-1·5″, acute or acuminate at the apex, acute or rounded at the base, somewhat unequal-sided, thinly coriaceous, glabrous dark-green above, paler and pubescent on the nerves beneath; lateral-nerves 5-6 pairs usually strong and prominent beneath with conspicuous venation between; petioles ·1″ long, stout, pubescent; stipules small, triangular, caducous. Flowers in dense, axillary clusters or along the naked branches below the leaves, males on filiform, pubescent pedicels ·25″ long; females sessile. Male fl.: Sepals 5-6, linear-oblong, acute or obtuse, ·1″ long, puberulous outside. Anthers 3; connectives separating after pollinisation.

Female fl.: minute, sessile. Calyx turbinate, 6-lobed; lobes sparingly pubescent, reflexed. Style subglobose, deeply 3-lobed. Capsule depressed-globose, obtusely trigonous, 6-celled, ·25″ in diameter, crowned with the 3-lobed style in the intruded apex, usually fascicled along the leafless branches; pedicels short, stout, pubescent; seeds triangular, light-red.

Western peninsula from the Konkan to Cochin, apparently endemic, common on the Supa ghâts of N. Kanara near Anmode also on the Arbail ghàt in rain-forest. Fl. C. S. Fr. Apl.

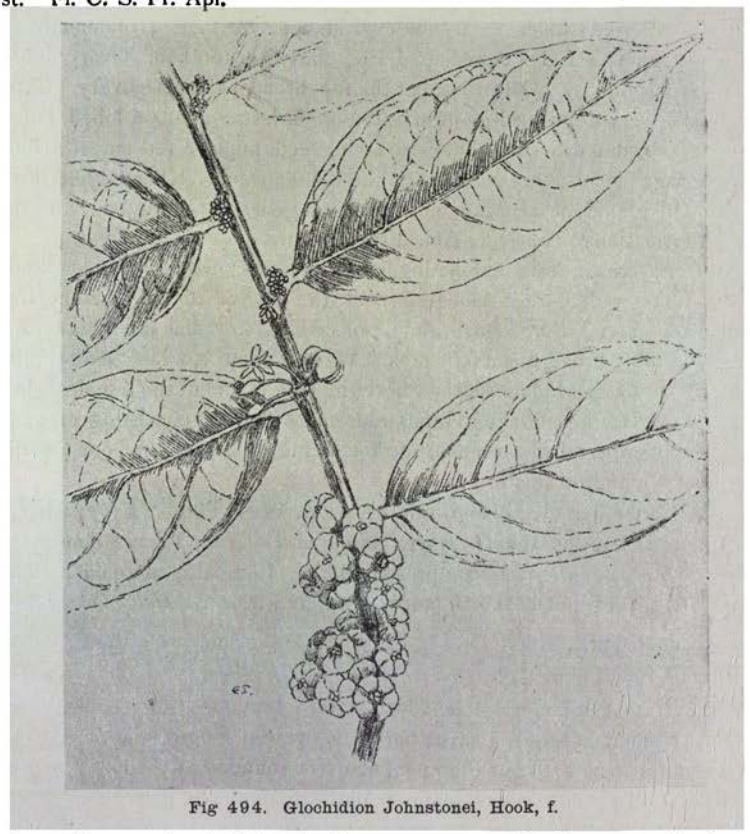

Fig 494. Glochidion Johnstonei, Hook, f.

A small tree 30′-40′ high and with stems up to 1·5′ in diameter. Bark rough, dark-coloured, usually deeply fissured; inner-bark thick, reddish, fibrous. Wood light-red, soft. Annual-rings distinct. Pores small, scanty, equally distributed. Medullary rays moderately broad. Weighs about 40 lbs. to the cub. ft.

5. G. arboreum, Wight Ic. t. 1907; Beddome Fl. Sylv. 193; *Phyllanthus arboreus,* Muell. Arg. in DC. Prodr. 15. 2, 303.

A moderate-sized tree; branches flexuous, angled, glabrescent. Leaves elliptic or ovate-lanceolate, 2″-5″ by ·5″-2″, acute or acuminate at the apex, usually acute at the base, unequal-sided, thinly coriaceous, glabrous; lateral-nerves 6-8 pairs, slender, distinct, with raised nervation between; petioles ·1″-·25″ long; stipules coriaceous, triangular. Flowers in axillary, few-flowered fascicles, shortly pedicelled. Male fl. ·25″ across, on slender pedicels ·25″ long. Sepals oblong. Anthers 3; connectives long subulate. Female fl. ·25″ long including the style. Calyx tubular, coriaceous, glabrous, 6-toothed. Style stout, columnar, slightly dilated at the top; lobes 4-6, thick, short, obtuse. Ovary included in the contracted base of the large style. Capsule depressed-globose, ·5″ in diameter, 4-6-lobed, crowned with the long, columnar style; seeds trigonous, red.

Nilgiri, Shevagiri and Bababuden hills; Dodmune ghát, N. Kanara in rain-forest. Fl. Feb.-Mch. Fr. H. S. The leaves are minutely white-dotted beneath.

6. G. velutinum, Wight Ic. t. 1907-2; Fl. Br. I. 5, 322; Bedd. Fl. Sylv. 195; Cooke Fl. Pres. Bomb. 2, 578; Gamble Ind. Timb. 602; *Phyllanthus nepalensis,* Brandis, For. Fl. 453. *Paritza, showra,* M. *Parwi,* H. *Salai-mara,* K.

A small tree or large shrub; branches flexuous, grey velvetty-pubescent. Leaves ovate or elliptic-lanceolate, 2″-4·5″ by 1″-2·5″, thinly coriaceous, sparsely pubescent above, densely pubescent beneath; lateral-nerves about 6 pairs arching upwards and looping within the margin, strong beneath; petioles very short; stipules small, triangular-acute, pubescent. Flowers shortly pedicelled, in few-flowered, axillary clusters. Male fl. on slender pedicels up to ·25″ long. Sepals ovate, acute, pubescent. Anthers 3; connectives short. Female fl. very shortly pedicelled. Sepals of male. Ovary 4-7-celled, tomentose; style longer than the ovary, 4-7-toothed, glabrous at the tip. Capsule depressed-globose, ·3″ in diameter, 4-7-lobed, pubescent, crowned with the intruded style; seeds angular, bright-red.

Hot valleys of the Himalaya from Kashmir eastwards to Burmah, Western peninsula from the Konkan to the Nilgiris; throughout the monsoon-forests of the Konkan and N. Kanara, very common on the Supa ghâts in deciduous forest. Fl. Dec.-Mch. Fr. Mch.-June. Bark brown, rough. Wood reddish-grey or red, rather soft. Annual-rings distinct. Pores small, scanty, distributed in short, radial lines. Medullary rays moderately broad, short, giving a silver grain. Weighs about 42 lbs. to the cub. ft. Only used for fuel in N. Kanara. The bark is said to contain tannin. A distinct and common species.

7. G. malabaricum, Bedd. For. Man. in Fl. Sylv. 194; Fl. Br. I. 319; Cooke Fl. Pres. Bomb. 2, 578; *Phyllanthus malabaricus,* Muell. Arg. in Linnæa 34, 69 and in DC. Prodr. 15, 2, 305.

Fig 495. Glochidion velutinum, Wgt.

A small tree; branchlets glabrous. Leaves ovate or elliptic-lanceolate, 3″-5″ by 1·25″-2″, acuminate at the apex, acute or obtuse at the base, thinly coriaceous, glabrous; lateral-nerves 6-8 pairs, arching upwards; petioles short; stipules lanceolate-subulate. Flowers in axillary, many-flowered clusters. Male fl. long-pedicelled; pedicels up to ·5″ long, filiform. Calyx divided to the base; sepals short, linear. Anthers 3; connectives triangular, acute. Female fl. minute, sessile or shortly pedicelled. Sepals erect, linear-oblong. Ovary shorter than the style, pubescent. Style minute, conical or cylindric, 4-7-toothed at the tip, pubescent. Capsule small, depressed-globose, 3-5-lobed, on short pedicels, pubescent.

Western peninsula from the Konkan to the Nilgiris, apparently endemic. Fl. C. S. Very closely allied to *G. ellipticum*.

8. **G. ellipticum,** Wight Ic. t. 1906; Fl. Br. I. 5, 321; Bedd. Fl. Sylv. 193; Cooke Fl. Pres. Bomb. 2, 579; *G. diversifolium,* var. (β) *Wightiana;* Bedd. Fl. Sylv. 193.

A large shrub or small tree; branches angled, glabrous. Leaves ovate or elliptic-lanceolate, 2″-5″ by 1″-2″, shortly acuminate at the apex, acute at the base, unequal-sided, thinly coriaceous, glabrous; petioles short; stipules triangular acute. Flowers in dense, axillary fascicles. Male fl. very small on slender, pubescent pedicels up to ·25″ long. Sepals ovate, acute or obtuse, glabrous; pedicels tomentose. Anthers 3; connectives acute. Female fl. subsessile or shortly pedicelled. Sepals 6, linear, pubescent. Ovary globose, tomentose; style conical, ·1″ long, nearly twice as long as the erect sepals, distinctly 4-6-toothed at the tip. Capsule depressed-globose, ·2″ in diameter, 4-6-lobed, pubescent or glabrous, crowned with the remains of the conical style; seeds triangular, rounded at the back, pale reddish-brown shining.

Malabar, South Konkan, N. Kanara in rain-forest near the Ainshi ghât, apparently endemic in the W. peninsula. Fl. Dec.-Feb. Fr. Feb.-Mch. A very rare species in the Bombay Presidency, scarcely differs from *G. malabaricum.*

7. BREYNIA, FORST.

Glabrous shrubs or small trees. Leaves alternate, small, entire, often distichous, stipulate. Flowers small, monœcious, axillary, solitary or the males fascicled. Petals and disk obsolete in both sexes. Male fl.: Calyx turbinate, truncate; rim thickened and lobulate. Stamens 3, central; filaments united into a column; anthers adnate to the whole length of the column, slender; cells linear, parallel. Pistillode 0. Female fl.: Calyx coriaceous, hemispheric, turbinate, campanulate or rotate, broadly 6-lobed, often enlarged and disciform in fruit. Staminodes 0. Ovary globose, 3-celled, fleshy above; ovules 2 in each cell; styles 3, bifid or obscure. Fruit globose or depressed, indehiscent or with a 6-valved pericarp enclosing 3-6 indehiscent cocci, seated on the calyx. Seeds with a membranous testa; albumen fleshy; cotyledons broad; radicle long.

Calyx of the female flower much enlarged in fruit 1. B. patens.
Calyx of the female flower not or little enlarged in fruit ... ... 2. B. rhamnoides.

1. **B. patens,** Benth. in Gen. Plant. 3, 277; Fl. Br. I. 5, 329; Cooke Fl. Pres. Bomb. 2, 583; Gamble Ind. Timb. 603: *Melantheopsis patens,* Muell. Arg. in DC. Prodr. 15, part 2, 437; Bedd. Fl. Sylv. 196; Brandis For. Fl. 455; *M. turbinata,* Wight Ic. t. 1897 (by error in tab. *truncata*); Dalz. & Gibs.

Bomb. Fl. 234; *Phyllanthus turbinatus*, Kœn. ex Roxb. Hort. Beng. 104; Grah. Cat. Bomb. Pl. 180. *Kangli*, M.

A much-branched deciduous, glabrous shrub; branchlets slender, smooth, quadrangular. Leaves ovate, distichous, ·5″-1″ by ·3″-·6″, dark-green, drying black above, glaucous beneath; lateral-nerves 3-5 pairs, distinct; petioles short, slender; stipules small, triangular-subulate, persistent. Flowers appearing with the young leaves, solitary or few on slender pedicels; male below on slender, drooping pedicels; female above on erect, shorter pedicels. Male fl. yellowish, 1-3-fascicled. Calyx turbinate, ·1″ long, truncate or obscurely crenate at the mouth. Anthers adnate to the column. Female fl. greenish. Calyx-lobes 6, deeply rounded, in 2 series. Styles 3, bifid. Fruit depressed-globose, orange-red, ·5″ in diameter, seated on the much enlarged calyx; seeds 6, triquetrous, enclosed in an orange-yellow arillus; testa perforate in the hilum.

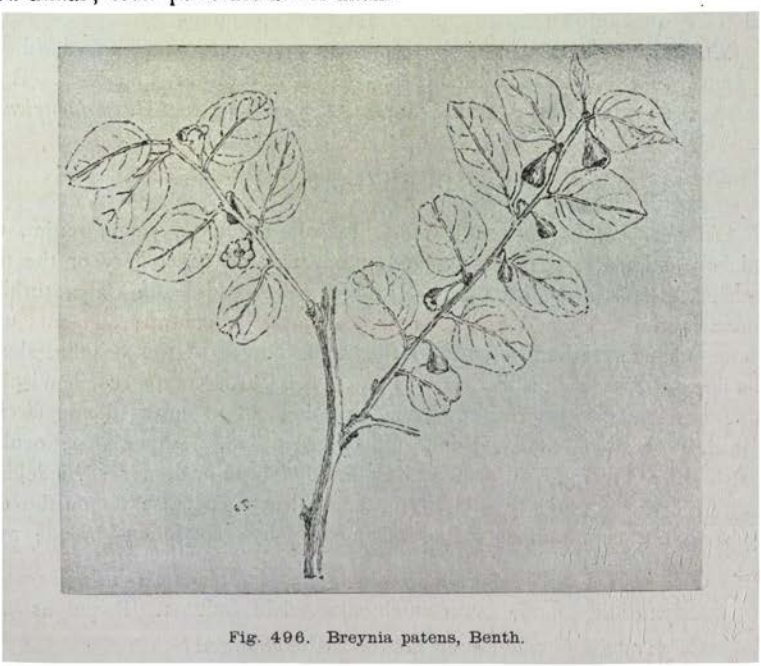

Fig. 496. Breynia patens, Benth.

Tropical Himalaya from Nepal to Mishmi and Assam, Western peninsula from the Konkan southwards to Ceylon; common on the Konkan and N. Kanara ghàts in rain and monsoon-forest, often diœcious. Fl. Apl.-June. Fr. Aug.-Sept. Bark grey, smooth. "Wood white, hard and close-grained. Pores small, regular, evenly distributed. Medullary rays moderately broad, regular, long, wavy, conspicuous" Gamble. Has an alliaceous odour.

2. B. rhamnoides, Muell. Arg. in DC. Prodr. 15, part 2, 440; Fl. Br. I. 5, 330; Brandis For. Fl. 455; Bedd. Fl. Sylv. 196 (by error named *Melantheopsis patens.)*; Cooke Fl. Pres. Bomb. 2. 583; Gamble Ind. Timb. 604.

A large dehiscent, glabrous shrub or small tree; branches flexuous, angular. Leaves distichous, ovate, ·5″-1·5″ by ·4″-1″ obtuse or subacute at the apex, acute at the base, membranous, drying black above, pale beneath; lateral-nerves 4-8 pairs, slender, looping within the margins; petioles ·1″ long, slender; stipules minute, subulate, persistent. Flowers small, yellow; male on short, filiform pedicels in few-flowered fascicles; female solitary on short, decurved pedicels. Male fl.: Calyx turbinate; mouth truncate or very obscurely lobed. Staminal-column truncate, produced beyond the anthers. Female fl.: Calyx cup-shaped; lobes ovate or triangular acute. Ovary oblong, truncate at the top, exserted; styles very obscure. Fruit small, globose, fleshy, scarcely ·25″ in diameter, dull-red, seated on the slightly enlarged calyx; seeds exarillate; testa imperforate except at the base.

Tropical India from Oudh to Assam and Burmah and southwards to Travancore and Ceylon; throughout the Konkan and N. Kanara, often in hedges. Fl. H. S. Fr. R. S. Bark yellowish-grey, rough. Wood brownish, hard and close-grained. Pores small, evenly distributed. Medullary rays fine, numerous.

8. SAUROPUS, Blume.

Small shrubs. Leaves alternate, distichous, membranous, entire; stipules minute. Flowers pedicellate, monœcious, minute, axillary, fascicled or solitary. Perianth simple. Male fl.: Calyx 6-lobed, disciform, urceolate or turbinate; mouth small with superficial thickenings which meet round the stamens. Stamens 3 on a triangular column; anthers extrorse. Pistillode 0. Female fl.: Calyx 6-cleft, accrescent, persistent. Ovary ovoid or globose, 3-celled, rounded or concave at the apex; ovules 2 in each cell; styles 3, sessile, bifid or bipartite. Fruit depressed-globose; epicarp fleshy or coriaceous, 6-valved or rupturing irregularly, containing 6 indehiscent, 3-angled, crustaceous or bony cocci; albumen fleshy; cotyledons broad, flat; embryo straight or nearly so.

S. quadrangularis, Muell. Arg. in Linnæa 32, 72; Fl. Br. I. 5, 335; Cooke Fl. Pres. Bomb. 2, 582; *Ceratogynum rhamnoides,* Dalz. & Gibs. Bomb. Fl. 234. *Chikli,* M.

A dwarf glabrous shrub; branches slender, angular. Leaves ovate, ·5″-·75″ by ·3″-·5″, obtuse, subacute and apiculate at the apex, acute at the base, thin, dark-green above, pale beneath, lateral-nerves 4-5 pairs, slender; petiols ·1″ long; stipules minute, triangular-subulate. Male fl. on filiform pedicels up to ·25″ long. Calyx divided into 6 lobes halfway to the base; lobes horn-shaped,

acute, swollen at the base which arches over the minute staminal-column. Female fl. solitary, on short, axillary pedicels. Calyx deeply divided into 6 broad, subobtuse, veined lobes, arranged in 2 rows. Fruit globose, ·3″ in diameter; cocci rounded at back with triangular faces, smooth, pale.

Northern Behar, Coromandel Coast, Mysore, Burmah, Konkan and N. Kanara in rain-forest. I have only found this rare shrub in the jungles near Yellapore and on the Arbail ghát; it occurs also according to Dalzell near Vingurla on the coast of the Konkan. Fl. June-Aug. Fr. July-Sept.

9. FLUEGGIA, WILLD.

Unarmed or thorny shrubs. Leaves small, alternate, distichous, entire, stipulate. Flowers dicœcious, minute, axillary; males in axillary fascicles; females solitary or few together. Petals 0. Male fl.: Sepals 5, subpetaloid, imbricate. Stamens 5, alternating with disk-glands; filaments free; anthers erect with parallel cells. Pistillode large, 2-3-fid. Female fl.: Calyx same as in the male. Disk annular, flat, toothed. Ovary 1-3-celled; ovules 2 in each cell; styles 3, bifid. Fruit globose, more or less succulent, bursting irregularly or separating into 2-valved cocci. Seeds trigonous, dorsally convex, ventrally acute; albumen scanty; cotyledons flat; embryo curved.

A large, unarmed shrub or small tree ... ... 1. F. microcarpa.

A rigid, thorny shrub ... ... 2. F. Leucopyrus.

1. F. microcarpa, Blume Bijdr. 580; Fl. Br. I. 5, 328; Cooke Fl. Pres. Bomb. 2, 581; Gamble Ind. Timb. 603; *F. Leucopyrus,* Dalz. & Gibs. Bomb. Fl. 236 (not of Willd.); *Securinega obovata,* Muell. Arg. in DC. Prodr. 15, part 2, 449; Brandis For. Fl. 445; Bedd. Fl. Sylv. 197; *Phyllanthus retusus,* Roxb. Fl. Ind. 3, 657; *Pandharphalli, kodarsi,* M. *Bili-horli,* K.

A large glabrous shrub; branchlets compressed, angled, minutely lenticellate. Leaves variable, elliptic, obovate or orbicular, rounded, obtuse or subacute at the apex, acute at the base, thin, pale beneath; lateral-nerves 5-7 pairs, slender; petioles ·1″-·2″ long; stipules minute, linear. Flowers in axillary, bracteate fascicles; male usually numerous; female few (1-5 together); bracts linear, minute. Male fl. on capillary pedicels up to ·3″ long. Sepals obovate, obtuse. Stamens 3-5, exserted; filaments free with alternate glands at the base. Pistillode 3-fid with usually recurved tips. Female fl. on slender pedicels up to ·2″ long. Sepals of male. Ovary subglobose, on an annular disk; styles 3, deeply bifid. Fruit globose, of 2 kinds mostly minute with a dry pericarp and a few, large (·3″ in diameter) with a white, fleshy, edible pericarp; seeds rounded at the back, minutely punctate.

Fig 497. Flueggia microcarpa, Blume.

Throughout India, up to 6000′ in the outer Himalaya, southwards to Malacca and Travancore, Burmah, China and Australia; common in the Bombay presidency in deciduous monsoon and thorn-forest. Fl. H. S. Fr. R. S. Bark grey with small lenticular specks. Wood reddish-yellow, close-grained, strong and durable. Used for agricultural implements. The astringent bark serves for poisoning fish.

2. F. Leucopyrus, Willd. Sp. Pl. 4, 757; Fl. Br. I. 5, 328; Cooke Fl. Pres. Bomb. 2, 581; Gamble Ind. Timb. 603; Trimen Fl. Ceyl. 4, 33; *F. virosa*, Dalz. & Gibs. Bomb. Fl. 236; *Securinega Leucopyrus*, Muell. Arg. in DC. Prodr. part 2, 451; Bedd. Fl. Sylv. 197; Brandis For. Fl. 456. *Vorepuvan*, M. *Kiran*, Sind. *Parpo*, Kon.

A large rigid branched bushy shrub; branches divaricate, straggling, slender, angular usually terminating in a sharp spine. Leaves small, obovate or obcordate, ·5″-1″ by ·3″-·6″, acute or obtuse at the apex, acute at the base, thin, glabrous, glaucous beneath; lateral-nerves 6-8 pairs, slender, distinct; petioles short; stipules linear acute. Flowers pedicellate, in axillary fascicles, female fewer than the male very similar to those of *F. microcarpa*. Fruit a white, globose, 3-celled berry ·25″ in diameter.

India, Punjab, Burmah, W. peninsula, Ceylon; throughout the presidency and Sind in dry open forest. A very common species. Fl. H. S. Fr. R. S. Bark grey or dark-brown covered with small, white lenticels. Wood pink, hard and close-grained; used for fuel. The fruits of both this species and *F. microcarpa* are edible.

10. PUTRANJIVA, WALL.

Evergreen trees. Leaves alternate, stipulate, entire or serrulate. Flowers usually diœcious, axillary, apetalous; males clustered; female subsolitary. Disk O. Male fl.: Calyx 3-6-lobed; lobes imbricate. Stamens 2-3, central; filaments connate or free; anther-cells parallel. Female fl.: Calyx as in the male. Ovary 2-3-celled; ovules 2 in each cell; styles short, spreading, dilated into broad, spreading arms. Fruit indehiscent, 1-seeded with a bony endocarp. Seed ovoid; testa crustaceous; albumen fleshy; cotyledons broad and flat.

Fig 498. Flueggia Leucopyrus, Willd.

P. Roxburghii, Wall. Tent. Flor. Nep. 61; Fl. Br. I. 5, 336; Brandis For. Fl. 451; Bedd. Fl. Sylv. 275; Dalz. & Gibs. Bomb. Fl. 236; Cooke Fl. Pres. Bomb. 2, 590; Gamble Ind. Timb. 604, *Putranjiva,* Vern. *Amani,* K. *Putajan,* Hind.

A moderate-sized evergreen tree; branches slender, pendulous, grooved, lenticellate; branchlets puberulous. Leaves ovate or elliptic-lanceolate, 2″-3·5″ by 1″-1·25″, acute, obtuse or shortly acuminate at the apex, acute at the base, more or less sharply serrate, thinly coriaceous, glabrous shining; lateral-nerves numerous, slender, distinct; petioles about ·25″ long; stipules small, triangular acute, early caducous. Flowers yellowish, diœcious. Male fl. minute, sessile or very shortly pedicelled, in dense, rounded, more or less separate clusters on short axillary branches. Sepals oblong, acute or obtuse, ciliolate. Stamens 3; filaments short; anthers globose, longitudinally elastically dehiscent Female fl. axillary, solitary, or in pairs, larger than the males. Sepals 5-6, elliptic obtuse, concave, ciliate. Ovary 3-celled, ovoid, tomentose; styles 3, recurved; stigmas large, flabellate. Fruit a globose drupe rounded or pointed at the top, ·5″ in diameter, grey-tomentose; stone very hard, rugose.

Tropical India in the sub-Himalayan tract from the Chenab eastwards to Pegu and southwards to Ceylon in rain-forest along the banks of rivers and other shady localities, often cultivated. Konkan and N. Kanara but nowhere common; cultivated in gardens near Poona and elsewhere in the Deccan and Southern Mahratta Country. Fl. Mch.-May. Fr. Feb.-Mch. after. Usually a small or

moderate-sized tree. Bark whitish, corky, with shallow fissures; inner-bark yellow. Wood light-grey, moderately hard and close-grained, durable. Annual-rings marked by prominent lines. Pores small or moderate-sized, scanty, subdivided or in short radial lines. Medullary rays fine, numerous, uniform, closely packed and crossed by numerous, transverse bars of light-coloured tissue. Weighs about 48 lbs. to the cub. ft. Used for tool-handles and turning. The bony nuts are strung into necklaces which are worn by children to preserve them from evil, hence the name *Putranjiva* (life of the child). The leaves are lopped for fodder.

11. HEMICYCLIA, W. & A.

Evergreen trees or shrubs. Leaves alternate, entire, often unequal-sided at the base. Flowers small, dicœcious, apetalous; male clustered at the nodes; female subsolitary. Male fl.: Sepals 4-5, imbricate; inner larger. Stamens 4-23 inserted round an orbicular disk; filaments free; anther-cells parallel. Pistillode 0. Female fl.: Calyx as in the male. Disk flat, annular. Ovary obliquely reniform, ovoid, 1-celled (rarely 2-celled); ovules 2 in each cell; style short; stigmas broad reniform, or orbicular. Fruit drupaceous with a hard bony endocarp. Seed usually solitary, grooved, arillate; albumen fleshy; cotyledons broad, flat; embryo straight.

Fruit small, globose, red, about ·25″ in diameter	1.	H. sepiaria.
Fruit obovoid, oblique, green, ·5″-·75″ long ...	2.	H. venusta.

1. H. sepiaria, W. & A. in Edinb. New. Phil. Jour. 14, 297; Fl. Br. I. 5, 337; Dalz. & Gibs. Bomb. Fl. 229; Bedd. Fl. Sylv. 198; Cooke Fl. Pres. Bomb. 590; Gamble Ind. Timb. 605.

A small tree or large evergreen shrub; branchlets grey-puberulous. Leaves elliptic or ovate-oblong, 1·5″-3·5″ by ·75″-1·75″, rounded, obtuse or retuse at the apex, rounded or cordate at the base, entire or repand-toothed, coriaceous, glabrous shining above, pale beneath; nervation reticulate, obscure; petioles about ·2″ long. Flowers pubescent or villous, pedicellate; male in axillary, bracteolate clusters; pedicels ·2″ long, pubescent; female subsessile with the pedicels lengthening in fruit. Male fl.: Sepals 4, ovate-oblong or suborbicular, ciliolate. Stamens 6-8 inserted on a cupular disk; filaments slender; anthers oblong. Female fl.: Calyx as in the male. Ovary 1-2-celled; style nearly obsolete; stigma orbicular or semicircular with crenulate margins, subsessile at the top of the ovary. Fruit globose, ·25″ in diameter, edible; endocarp bony.

Western peninsula in dry evergreen forests of the South Deccan peninsula and Carnatic also in Ceylon where it is a very common and characteristic species of the dry zone. I have not found it in the Bombay presidency; it is mentioned however in Dalz. & Gibs. Bomb. Fl. but without any locality given.

Wood hard and close-grained like *Boxwood,* used for turning and axe-handles. Fruit sweet but insipid, eaten by the natives in Ceylon.

2. H. venusta, Thw. in Hook. Jour. Bot. 8, 272; Fl. Br. I. 5, 339; Dalz. & Gibs. Bomb. Fl. 229; Bedd. Fl. Sylv. 198; Cooke Fl. Pres. Bomb. 2, 591; Gamble Ind. Timb. 606; *Astylis venusta,* Wight Ic. t. 1992.

A small evergreen tree; branches glabrous. Leaves elliptic or oblong, 3″-5″ by 1″-1·75″, obtuse or very shortly acuminate at the apex, acute, somewhat unequal-sided at the base, coriaceous, glabrous, shining above, pale beneath; lateral-nerves about 6 pairs scarcely more distinct than the reticulate venation beneath; petioles ·25″ long. Flowers axillary; males in few-flowered fascicles; females solitary. Male fl. on nearly glabrous pedicels ·25″ long. Sepals 4, ovate, obtuse, ·1″ long, tomentose outside. Stamens about 6 inserted outside a cup-shaped, crenulate, thick disk; filaments ·1″ long; anthers oblong, sagittate. Female fl. on pedicels as long as those of the male. Sepals similar to those of the male. Ovary 1-2-celled, seated on a flat disk; stigma sessile, peltate. Fruit oblong, oblique, about ·75″ long, glabrous, crowned with the remains of the stigma; pedicels 2″ long, slightly thickened upwards; pericarp thick.

Western peninsula from N. Kanara to the Nilgiris and South Tinnevelly up to 4000′, fairly common on the Southern ghâts of N. Kanara in rain-forest. The correctness of the statement. "Hills in the Dharwar zilla" in Dalz. & Gibs. Bomb. Fl. 229 is open to doubt as there is no rain-forest in that district. The habitat is probably intended for *H. sepiaria,* and not for *H. venusta,* Fl. Nov. Fr. Jan. A tree 60′ high by 1′-2′ in diameter. Bark-smooth. Wood grey, hard and close-grained. Pores sub-divided or in radial strings. Medullary rays fine, numerous, crossed by prominent, alternate bands of dark and light-coloured tissue. Weighs about 51 lbs. to the cub. ft. Splits in seasoning.

12. CYCLOSTEMON, Blume.

Trees. Leaves alternate, entire or crenulate often unequal-sided at the base. Flowers dicœcious, apetalous, axillary, in racemes or clusters, pedicelled. Male fl.: Buds globose. Sepals 4-6, broad, imbricate. Stamens 4-40, inserted round the margin of the disk; filaments free; anthers erect. Female fl.: Sepals of the male. Ovary 2-4-celled on the small disk; cells each with 2 ovules; styles elongate or O; stigmas dilated, fleshy or connate into a peltate disk. Fruit sub-globose or ovoid, indehiscent. Seed solitary in each cell; albumen fleshy; cotyledons broad and flat.

C. confertiflorus, Hook. f.; Fl. Br. I. 5, 341; Gamble Ind. Timb. 606; Cooke Fl. Pres. Bomb. 2, 591. *Augai-mara,* K.

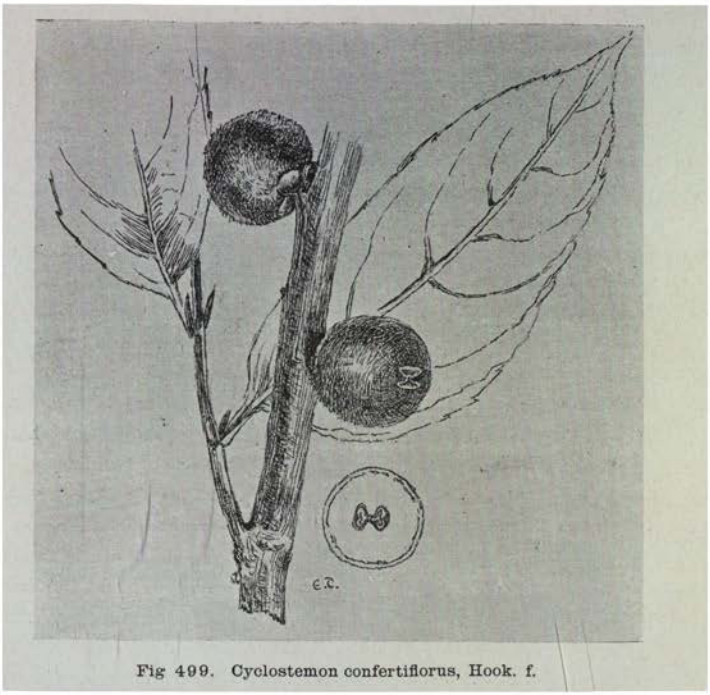

Fig 499. Cyclostemon confertiflorus, Hook. f.

A large evergreen tree; branchlets smooth, angular, grooved. Leaves oblong or oblong-lanceolate, 4″-11″ by 1·5″-3″; obtusely acuminate at the apex, acute and often unequal-sided at the base, distantly serrate or repand, very coriaceous, glabrous shining; lateral-nerves 8-10 pairs prominent beneath with raised venation between; petioles ·25″ long, stout; stipules small, triangular-lanceolate, coriaceous, caducous. Flowers on the branches below the leaves; male shortly pedicelled, in dense, bracteate clusters from thick nodes; female shortly pedicelled, solitary or in few-flowered clusters on the old wood; bracts connate into a small cup. Male fl.: Sepals 6, white, orbicular, thick, veined, concave, about ·25″ in diameter. Disk depressed funnel-shaped, radiately ribbed with a membranous, lobed margin. Stamens about 20, inserted outside the disk; filaments short, stout; anthers oblong. Pistillode minute, conical. Female fl. globose in bud, ·25″ in diameter. Sepals green, imbricate, unequal. Ovary globose, seated on the cup-shaped disk, covered with black or brownish tomentum; stigmas 2, nearly sessile, flat hemispheric, the round edges touching. Fruit sub-globose crowned with the remains of the stigmas, laterally flattened, 1·5″ in diameter, yellow, smooth; endocarp fleshy; seeds 2, plano-convex, ·75″ long, with a rough, fibrous episperm.

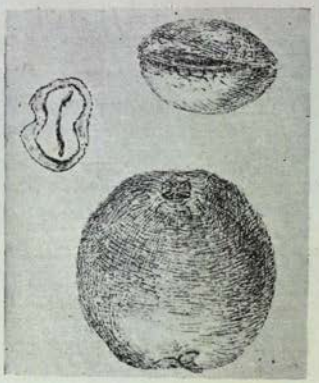

Fig 500 .Cyclostemon confertiflorus, Hook f.—*Fruit and seed.*

N. Kanara, moist region below the ghâts between Devimone and the Yena Rocks in monsoon and rain-forest. Fl. C. S. Dec.-Jan. Fr. Apl.

A large tree with a fluted, irregular stem 60′ high by 1′-3′ in diameter (larger stems in some of the Kans near Yena) often buttressed at the base. Bark grey, scaly. Wood olive-grey, hard, smooth and compact. Annual-rings distinct, marked by a ring of dark tissue. Pores small, often in lines between the fine, closely arranged medullary rays. Weighs 56 lbs. to the cub. ft. The fruit is eaten by sambhur and is stated to be used for poisoning fish.

13. BISCHOFIA, Blume.

A large glabrous deciduous tree. Leaves alternate, 3-5-foliate; leaflets crenate. Flowers dicœcious, apetalous, in axillary panicles; males scattered or clustered, shortly pedicelled; females longer pedicelled. Male fl.: Sepals 5, concave, imbricating, concealing the anthers. Disk O. Stamens 5 inserted at the base of the pistillode; filaments short; anthers large, cells parallel. Pistillode short, stout, peltate. Female fl.: Sepals ovate, caducous. Staminodes 5, small or O. Ovary 3-celled; cells each with 2 ovules; styles long, linear, entire. Fruit a globose drupe, 3-4-celled, lined with a parchment-like. 2-valved endocarp. Seeds turgidly oblong; testa bony; albumen fleshy; cotyledons broad, flat; radicle straight, elongate.

B. javanica, Blume Bijdr. 1168; Fl. Br. I. 5, 345; Brandis For. Fl. 446; Bedd. Fl. Sylv. t. 259; Cooke Fl. Pres. Bomb. 2, 571; Gamble Ind. Timb. 607; *Stylodiscus trifoliatus,* Benn. Pl. Jav. Rar. 133, t. 39; Dalz. & Gibs. Bomb. Fl. 235; *Bok,* Vern. *Nili-mara,* K.

A large or very large, glabrous tree of quick growth. Leaves alternate, 3-5-foliate; petioles 3″-6″ long; leaflets ovate, 3″-6″ by 1·5″-3″, shortly acuminate at the apex, acute at the base, coriaceous, glabrous shining; margins crenate; lateral-nerves 6-8 pairs, slender, distinct; petiolules of lateral leaflets ·25″-·5″, of the terminal leaflet 1″-1·5″ long; stipules membranous, caducous; stipels minute, caducous. Flowers small, greenish-yellow, in long-peduncled, axillary or supra-axillary panicles. Male fl. minute, on short, slender pedicels; bracts lanceolate. Sepals 5, obovate, concave. Stamens 5; filaments short; anthers globose. Pistillode peltate. Female fl. in smaller panicles than those of the male and with

shorter pedicels. Fruit reddish-brown, globose, ·25″ in diameter, fleshy; seeds 3-4 smooth, shining.

Tropical Himalaya from Kumaon eastwards and from Assam southwards. Western peninsula from the Konkan to the Nilgiris, not found in Ceylon; common on the Konkan and N. Kanara ghâts in rain-forest. Fl. Mch.-Apl. Fr. ripe Nov.-Dec. A very large tree usually with a cylindrical stem of considerable girth. Bark rough, dark-coloured, exfoliating in great angular scales. Wood red, moderately hard and rough; heartwood small, darker coloured, smelling of vinegar when freshly cut, does not warp or split in seasoning. Pores moderate-sized to large, subdivided or in short, radial lines, often containing resin. Medullary rays broad and fine; several fine between each pair of wavy, broad, dark-coloured rays. Weighs about 40 lbs. to the cub. ft. Used in the Nilgiris for building purposes where it is called *Red Cedar*. Deserves the attention of forest officers in N. Kanara where it is fairly common in the evergreen kans from Ainshi southwards. The leaves are often 5-foliate in N. Kanara where the tree is usually evergreen. The peltate stigma mentioned in Dalzell's description of the tree in the Bombay Flora refers evidently to the pistillode in the male flower.

14. APOROSA, Blume.

Trees. Leaves alternate, entire. Flowers minute, diœcious, apetalous; males in dense short, catkin-like spikes; females solitary or in short, few-flowered, bracteate spikes. Male fl.: Sepals usually 4, membranous, imbricate. Stamens 2-5 in the centre of the flower; filaments capillary; anthers didymous. Pistillode minute or obsolete. Female fl.: Sepals of the male. Ovary 2-celled; ovules 2 in each cell; stigmas small, plumose, short, spreading or recurved, simple or 2-4-cleft. Fruit a globose or ovoid capsule opening irregularly or 2-4-valved from the base; epicarp thin or fleshy; endocarp thin, often separable; cells glabrous or hairy within. Seeds plano-convex; albumen fleshy; cotyledons broad and flat.

A. Lindleyana, Baill. Etudes Gen. Euphorb. 645; Fl. Br. I. 5, 349; Bedd. Fl. Sylv. t. 286; Cooke Fl. Pres. Bomb. 2, 594; Gamble Ind. Timb. 608; Trimen Fl. Ceyl. 4, 440; *Scepa Lindleyana,* Wight Ic. t. 361; Dalz. & Gibs. Bomb. Fl. 236, *Sali, chella, bidchella,* K.

A small or moderate-sized tree; branchlets angled, glabrous. Leaves elliptic-oblong, 3″-7″ by 1·5″-2″ shortly acuminate at the apex, acute or rounded at the base, coriaceous, glabrous shining; lateral-nerves about 8 pairs, slender, distinct; midrib strong and prominent beneath; stipules lanceolate, early caducous. Male fl. in axillary often fascicled spikes 1″-1·5″ long. Sepals ovate-oblong, obtuse, ciliate. Stamens 2-3; filaments short; anthers globose. Female fl. in short, axillary racemes often 2-3 together; pedicels short, stout, tomentose. Sepals

ovate, acute, spreading, pubescent. Ovary ovoid, bristly hairy, narrowed into the short, tomentose style; stigmas 3, shortly 2-3-partite, scarcely plumose. Fruit subglobose, ·3″ in diameter crowned with the short style; pedicels ·15″ long, pubescent.

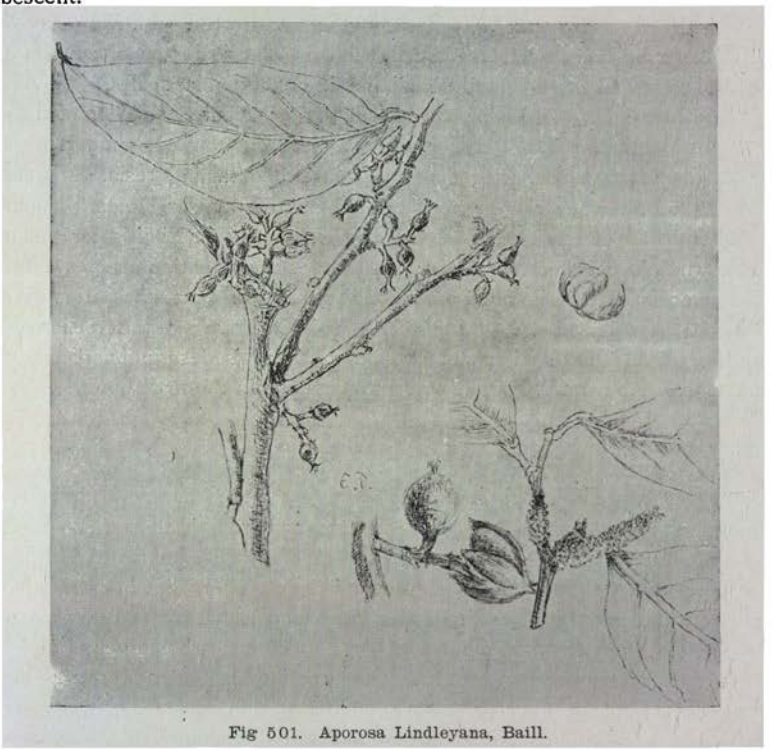

Fig 501. Aporosa Lindleyana, Baill.

Western peninsula from the Konkan southwards, Ceylon in the moist region up to 2000′; common in the rain-forests of the Konkan and N. Kanara. Fl. C. S. Fr. June. Bark thin, scaly; inner-bark yellowish with wavy, red fibres. Wood dull reddish-grey, smooth, rather soft. Annual-rings indistinct. Pores small, rather scanty, equally distributed. Medullary rays moderately broad and fine, wavy. Weighs 48 lbs. to the cub. ft. Used for building purposes and the poles are extensively employed for rafters near Yellapore and in other parts of N. Kanara.

15. ANTIDESMA, Linn.

Shrubs or small trees. Leaves alternate, entire, penninerved, stipulate. Flowers small or minute, diœcious, apetalous; males in slender, axillary or terminal,

simple or branched spikes or racemes. Male fl.: Calyx 3-5-lobed; lobes imbricate, often irregularly; anthers didymous; connective thickened. Disk entire or lobed. Pistillode minute, clavate, hairy. Female fl.: Calyx of the male. Ovary 1-celled; ovules 2, pendulous; stigmas 2-4, usually short, bifid or bipartite. Fruit an indehiscent, 1-seeded, more or less compressed drupe crowned with the sub-lateral or terminal stigmas. Seeds small; albumen fleshy; cotyledons broad, flat.

Leaves obtuse, tomentose beneath. Calyx 5-7-partite. Ovary tomentose	1. A. Ghæsembilla.
Leaves more or less acuminate, glabrous. Calyx cupular, 4-lobed. Ovary glabrous. Male flowers sessile. Stamens 3...	2. A. Bunius.
Male flowers pedicelled. Stamens 2. A large shrub.	3. A. diandrum.
Stamens 3-4. A small tree	4. A. Menasu.

1. A. Ghæsembilla, Gærtn. Fruct. 1, 189, t. 39; Fl. Br. I. 5, 357; Brandis For. Fl. 446; Bedd. Fl. Sylv. 200; Gamble Ind. Timb. 610; Trimen Fl. Ceyl. 4, 43; Cooke Fl. Pres. Bomb. 592; *A. pubescens,* Roxb. Cor. Pl. 2, 35, t. 167; Dalz. & Gibs. Bomb. Fl. 236; Grah. Cat. Bomb. Pl. 186; *A. paniculatum,* Roxb. Fl. Ind. 3, 770; Dalz. & Gibs. Bomb. Fl. 237.

A small tree; branches rusty-tomentose. Leaves broadly elliptic or nearly orbicular, 2″-3″, by 1·25″-2″ rounded, sometimes emarginate at the apex, obtuse or subcordate at the base, thinly coriaceous, glabrous above, tomentose beneath; lateral-nerves 5-6 pairs, distinct; petioles ·25″-5″ long; stipules small, lanceolate, caducous. Flowers sessile, in rusty-tomentose, short, panicled spikes; bracts minute. Male fl.: Calyx 5-7-partite, rusty-tomentose. Disk deeply lobed. Stamens usually 5; anthers somewhat horse-shoe shaped. Female fl.: Calyx of the male. Ovary pubescent; stigmas minute, recurved. Fruit ovoid or sub-globose, ·2″ in diameter, smooth, reddish-purple, succulent, edible.

Tropical Himalaya from Simla to Bhotan and southwards to Ceylon and Singapore, Malay peninsula and China. Western peninsula, common in the monsoon-forests of the Konkan and N. Kanara. Fl. Apl.-June. Fr. Sept.-Oct. Bark grey or brownish, scaly. Wood red with a darker coloured heartwood, smooth, hard, close and even-grained. Annual-rings indistinct. Pores small, uniformly distributed. Medullary rays moderately broad with numerous fine rays between. The fruit and leaves are eaten. The fruit has a pleasant subacid taste.

2. A. Bunius, Spreng. Syst. Veg. 1, 826; Fl. Br. I. 5, 358; Bedd. Fl. Sylv. 200; Cooke Fl. Pres. Bomb. 2, 593; Gamble Ind. Timb. 610; *A. Alexteria,* Willd.; Grah. Cat. Bomb. Pl. 186. *Amati,* M.

A small evergreen tree; branchlets grey-pubescent. Leaves elliptic or obovate-lanceolate, 3″-6″ by 1·25″-2″ shortly and finely acuminate at the apex, acute at the base, thin, glabrous shining; lateral-nerves 10-12 pairs, slender, distinct; petioles very short, stout; stipules linear, pubescent, early caducous. Flowers reddish, in peduncled spikes 1″-3″ long; male often compound; female solitary. Male fl. sessile. Calyx cupular, 4-lobed; lobes shallow, rounded, tomentose. Disk lobed, glabrous. Pistillode short, truncate. Female fl. on short pedicels. Calyx shortly tubular, truncate. Ovary glabrous; stigmas 3, short, spreading. Fruit ovoid, ·25″ long, smooth, fleshy, red, ultimately black.

Hotter parts of India, from Nepal to Assam and southwards to Ceylon and Singapore; Western peninsula on the Konkan and N. Kanara ghâts in rain-forest, rare in the Bombay presidency. Fl. May-June. Fr. Aug.-Sept. Bark greyish-brown. Wood reddish, hard like that of *A. Ghæsembilla.* The leaves and fruit are edible. "The fruit is very juicy and pleasantly acid." Trimen.

3. A. diandrum, Roth. Nov. Sp. 369; Fl. Br. I. 5, 361; Brandis For. Fl. 447; Bedd. Fl. Sylv. 201; Cooke Fl. Pres. Bomb. 2, 593; Gamble Ind. Timb. 610; Dalz. & Gibs. Bomb. Fl. 237; *A. lanceolarium,* Wall. Cat. 7284; Wight Ic. t. 766.

A large shrub or small tree; shoots glabrous or more or less pubescent. Leaves elliptic or obovate, 2″-5″ by 1″-2″, subacute, acute or very shortly acuminate at the apex, acute at the base, thin, glabrous above, pale and pubescent beneath; lateral-nerves about 6 pairs, slender, distinct; petioles short, stout, pubescent; stipules broad, lanceolate, longer than the petioles, early caducous. Flowers pedicellate, in long, interrupted, more or less pubescent racemes; bracts ovate acute, shorter than the pedicels. Male fl.: Calyx cup-shaped, very minutely 4-lobed; lobes obtuse. Stamens usually 2; filaments about ·1″ long, inserted at the base of the disk, pubescent; anthers horse-shoe shaped. Female fl. on shorter and stouter pedicels than in the male. Calyx deeper lobed than in the male. Ovary glabrous; style short, recurved. Fruit ovoid-acute, ·15″ long, purplish-red, edible.

Tropical Himalaya from Garwal eastwards and southwards to Travancore and Tenasserim, Ceylon up to 1500.′ Western peninsula from the Konkan southwards, common in moist monsoon and rain-forest from the coast inland, abundant at Karwar in the N. Kanara district near the seacoast growing on laterite and granitic soils. Fl. H. & R. S. from May to July. Fr. Aug.-Sept. Usually a shrub. Bark smooth, grey; inner-bark pale-red. Wood pinkish-grey, hard and close-grained. Annual-rings distinct. Pores very small, few, equally distributed. Medullary rays fine and very fine, distinct. Weighs about 50 lbs. to the cub. ft. The old, red-coloured leaves and subacid fruit are edible.

4. A. Menasu, Miq. Pl. Exsicc. Hohen. 104; Fl. Br. I. 5, 364; Cooke Fl. Pres. Bomb. 2, 594; *A. lanceolatum,* Dalz. & Gibs. Bomb. Fl. 237 (not of Tul.).

A small or moderate-sized tree; branchlets grey-pubescent. Leaves ovate or oblong-acuminate, 3·5"-10" by 1·25"-4" acuminate, often apiculate at the apex, acute at the base, thinly coriaceous, glabrous shining on both sides; lateral-nerves 8-10 pairs, slender, distinct; petioles short, stout, pubescent; stipules linear, pubescent, longer than the petioles. Flowers shortly pedicelled, in axillary and terminal, slender, solitary or paniculate racemes; bracts ovate or sometimes falcate, ·25" long, acute, tomentose. Male fl.: Calyx cup-shaped, 4-lobed; lobes shallow, rounded, thin, ciliate. Stamens 3-4, inserted between the lobes of the glabrous disk; filaments long; anthers horseshoe shaped. Pistillode columnar, glabrous. Female fl. cup-shaped, more deeply lobed than in the male; lobes acute. Ovary glabrous; stigmas 3-5. Fruit ovoid, pointed, ·15" long, purple, fleshy, edible.

Var. *linearifolia,* Hook. f.; Fl. Br. I. 5, 364. A small tree with linear-oblong, acuminate, thin shining leaves is common in monsoon and rain-forest in the southern talukas of N. Kanara.

Western peninsula from the Konkan southwards, Nilgiris up to 6000', Burmah and the Andamans; common in N. Kanara, often along the banks of nallahs in monsoon-forest Fl. Mch.-May. Fr. Sept.-Oct. Bark brownish scaly. Wood dark-red, similar to that of *A. Ghæsembilla.*

Baccaurea courtallensis, Muell. Arg. A large tree common on the Anamalais and along the Travancore ghàts is excluded from the present work as it is doubtfully indigenous in the Bombay presidency. I only found one female tree of this species (probably planted) near a Supari-garden and close to rain-forest at Sungsal, N. Kanara.

16. JATROPHA, Linn.

Herbs, shrubs or trees often glandular or prickly. Leaves entire or digitately lobed; stipules laciniate often ciliate. Flowers monœcious, in terminal cymes. Perianth usually double. Male fl.: Sepals 5, imbricate often petaloid. Petals 5, free or connate. Disk entire or of 5 glands. Stamens many; filaments of all or of the inner only connate. Pistillode 0. Female fl.: Perianth of the male. Petals sometimes obsolete. Ovary 2-4-celled; ovule solitary in each cell; styles bifid, connate below. Fruit a capsule of 2-4 cocci; cocci 2-valved with a bony or crustaceous endocarp. Seeds ovoid or oblong; testa crustaceous; albumen fleshy; cotyledons broad, flat.

Leaves 3-5-lobed below the middle, cordate, glandular hairy on the serrate margins ... ... 1. J. glandulifera.

Leaves entire or 3-lobed above the middle, neither cordate nor with glandular bristly margins ... 2. J. nana.

1. J. glandulifera, Roxb. Fl. Ind. 3, 688; Fl. Br. I. 5, 382; Dalz. & Gibs. Bomb. Fl. 229; Cooke Fl. Pres. Bomb. 2, 596; Trimen Fl. Ceyl. 4, 45; *J. glauca,* Vahl. Symb. 1, 78; Grah. Cat. Bomb. Pl. 183. *Underbibi, jungli-erandi,* Vern.

A shrub or small evergreen tree with much clear yellowish juice; trunk short, stout, dichotomously branched, glabrous shining. Leaves 3″-4″ long and as broad, deeply 3-5-lobed; lobes obovate or elliptic acuminate or acute at the apex, leaf cordate at the base sharply serrate with glandular bristles at the serrature tips; lateral-nerves numerous, slender; petioles 2″-3″ long not glandular; stipules divided into capillary gland-tipped segments. Flowers greenish-yellow, glandular, in long-peduncled, corymbose cymes. Male fl.: Calyx ·12″ long, very deeply divided; lobes ovate obtuse. Corolla 5-lobed; lobes obtuse, ·15″ long; tube very short. Stamens 8, connate at the base into a column free above. Disk of 5 glands at the base of the staminal-column. Female fl.: Perianth of the male. Ovary glabrous. Fruit a smooth, ellipsoid capsule ·5″ in diameter, slightly 3-lobed; seeds ellipsoid-oblong, smooth, shining, black.

Common near villages in Bengal, Burmah and the Northern Circars, rare in Oudh and the Punjab. Ceylon (abundant in a few places near the sea-coast); Western peninsula, Deccan near Pandarpore in the Sholapore district also near Kaladgi. Fl. Aug.-Nov. Graham states that there is a curious legend about its springing up on introduction at Pandarpore, also found near Kaladgi, very doubtfully indigenous in the Bombay presidency. Several other species of *Jatropha* are naturalized in many places throughout the Western peninsula and it is quite possible that the *Jungli-erandi* has been introduced in former times by the pilgrims attending the very ancient fair at Pandarpore. The seeds yield an oil similar to castor-oil which is used in native medicine.

2. J. nana, Dalz. in Dalz. & Gibs. Bomb. Fl. 229; Fl. Br. I. 5, 382; Cooke Fl. Pres. Bomb. 2, 597, *Kirkundi,* M.

A small sparingly branched undershrub; branches erect, glabrous. Leaves broadly ovate, 3″-5″ long and about as broad, entire or 3-lobed, cuneate at the base; lobes with entire, naked margins, ovate obtuse or subacute; middle-lobe largest with 3 prominent basal-nerves; petioles very short and up to 1″ long; stipules minute. Flowers pedicelled, glabrous, in few-flowered, terminal, paniculate cymes; bracts lanceolote acute without glandular margins. Male fl.: Calyx short, 6-lobed halfway down; lobes subulate. Stamens 8, connate below. Disk of minute glands. Corolla ·25″ long; lobes obovate, nearly free to the base, glandular-hairy at the base inside. Female fl.: Calyx-lobes lanceolate. Corolla as in the male. Ovary glabrous, seated on the saucer-shaped, glandular disk; styles 3, connate below the middle, each divided at the tip into 2 triangular lobes. Capsule obovoid, ·25″ long, flattened at the top, slightly 6-sulcate.

Hills near Poona on dry stony ground, apparently endemic in the Deccan. Fl. May-July. The only really indigenous species of *Jatropha* in the Western peninsula.

J. Curcas, Linn. Sp. Pl. 1006; Fl. Br. I. 5, 383; Brandis For Fl. 442; Dalz. & Gibs. Bomb. Fl. Suppl. 77; Cooke Fl. Pres. Bomb. 2, 598; Gamble Ind. Timb. 613. *Irundi, jaiphal, kurukarlu*, Vern. *Kadandla, maraharlu*, K. *Ratanjota, jamalgota*, Guz. *Ratan*, Bhil. *Poison, Physic or Purging nut.*

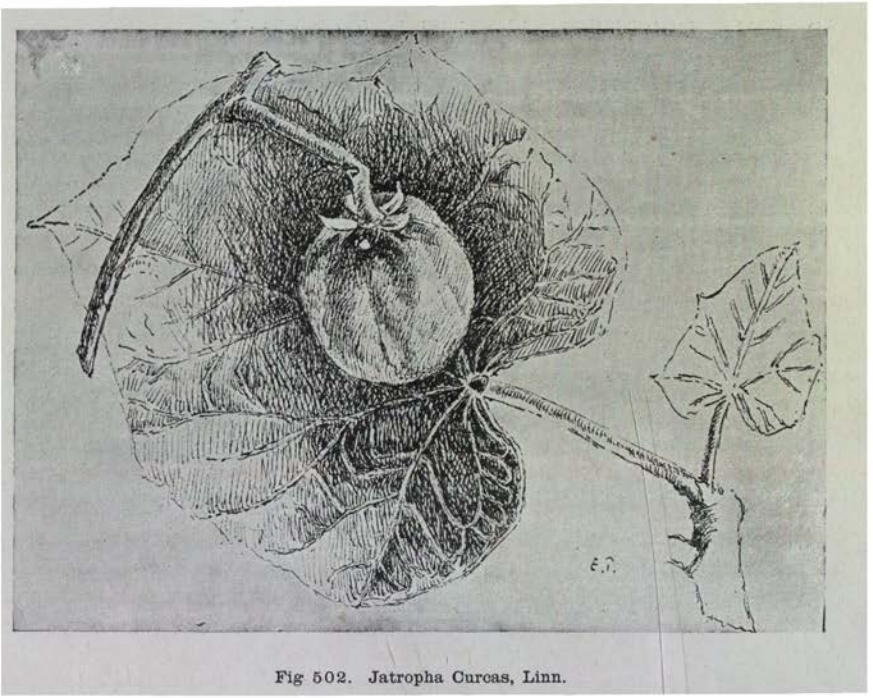

Fig 502. Jatropha Curcas, Linn.

A small evergreen nearly glabrous tree or soft wooded shrub with long-petioled, entire, 3-5-lobed or angled, orbicular, cordate leaves, 4″-6″ long and yellowish-green flowers in glabrous or pubescent cymes at the ends of the branches. Ovary and styles glabrous. Fruit a capsule 1″-1·5″ in diameter.

Indigenous in America, cultivated in most tropical parts of India; throughout the presidency, common in hedges, cultivated or naturalized. Fl. Apl.-May. Fr. R. S. Bark greenish-white, smooth, exfoliating in thin flakes. Wood soft, white, spongy, useless as timber. The seeds yield an oil used for burning and sometimes medicinally by the poorer class of natives.

J. gossypifolia, Linn. Sp. Pl. 1006; Fl. Br. I. 5, 393; Trimen Fl. Ceyl. 4, 46; Gamble Ind. Timb. 612; Cooke Fl. Pres. Bomb. 2, 597.

A bushy gregarious shrub native of Brazil. Leaves palmately 3-5-lobed at first brown shining, at length turning green; margins of leaves, petioles, stipules and flowers with long simple or fascicled glandular-tipped hairs. Flowers red. Fruit a 3-lobed capsule.

Common in waste places near Poona and elsewhere throughout the Deccan, abundant near the sea-coast at Karwar, N. Kanara, usually a garden escape. Resembles *J. glandulifera* with which it is often confounded.

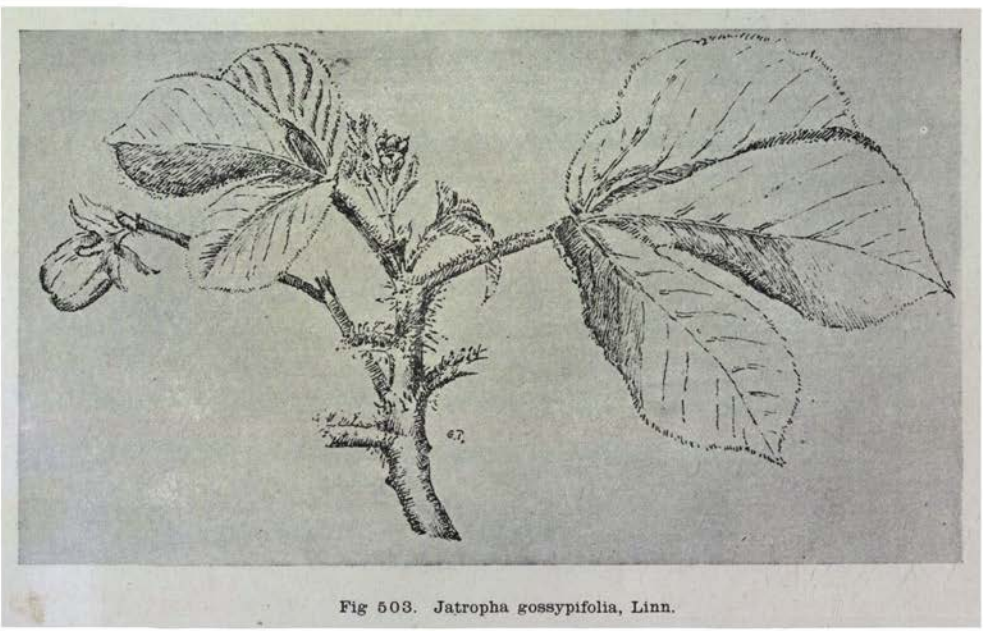

Fig 503. Jatropha gossypifolia, Linn.

ALEURITES, Forst.

Trees with simple or stellate pubescence. Leaves alternate, long-petioled, simple or lobed, 3-7 basal-nerved, 2-glandular at the base. Flowers small, usually monœcious, in lax, terminal, panicled cymes. Male fl.: Calyx subglobose, 2-3-partite; lobes valvate. Petals 5, imbricate in bud. Disk urceolate or glandular. Stamens numerous on a central torus, 5 outer opposite the petals alternating with small glands; filaments free; anther-cells parallel. Pistillode O. Female Fl.: Perianth of the male. Disk obscure or of glands alternating with the petals. Ovary 2-5-celled; cells each with 1 ovule; styles 2-5 each 2-cleft. Fruit a large drupe; putamen 1-5-celled; albumen oily; embryo straight; cotyledons flat.

A. moluccana, Willd, Sp. Pl. 4, 590; Fl. Br. I. 5, 384; Bedd. Fl. Sylv. t. 276; Cooke Fl. Pres. Bomb. 2, 626; *A. triloba,* Forst. Char. Gen. 112, t. 56; Dalz. & Gibs. Bomb. Fl. Suppl. 76. *Akrod, jaiphul,* Vern. *Bengal Walnut* or *Candle-nut Tree*

A moderate-sized or large evergreen tree native of the Malay Archipelago, cultivated throughout the presidency. Fl. Apl.-May. Fr. next C. S. Leaves polymorphous, crowded at the ends of the branches. Flowers white, shortly pedicelled. Fruit subglobose, 2″-2·5″ in diameter, smooth, olive-coloured, containing 1-2, hard, albuminous oily seeds.

The seeds are eaten and taste somewhat like walnuts; they yield a clear oil used for cooking and burning purposes. A large trade is carried on in this oil in the Sandwich Islands.

17. CROTON, Linn.

Trees or shrubs rarely herbs; young parts stellate-hairy or scaly. Leaves alternate, usually with 2 stipitate glands at the base. Flowers small, monœcious, in bracteate racemes or spikes; bracts small. Male fl.: Calyx usually 5-partite; lobes slightly imbricate in bud. Petals 5, small, often woolly or hairy. Disk-glands alternating with the petals and opposite to the sepals. Stamens inserted on a hairy receptacle, usually numerous; filaments inflexed in bud afterwards erect. Pistillode O. Female fl.: Sepals more ovate than in the male, rarely enlarged in fruit. Petals smaller than the sepals or O. Disk annular or of 4-6 glands. Ovary lepidote or stellately-tomentose, usually 3-celled; cells each with a solitary ovule; styles long slender, 2-4-cleft. Capsule globose, more or less 3-lobed, consisting of 3 cocci; cocci 2-valved each 1-seeded. Seeds smooth, ovoid, with a small caruncle; testa crustaceous; albumen copious; cotyledons broad.

Leaves entire, silvery-scaly beneath ... ... 1. C. reticulatus.

Leaves crenate or serrate, glabrous when old.

Capsule subglobose, clothed with small, orbicular scales ... ... 2. C. oblongifolius.

Capsule globose, deeply 3-lobed, stellately-hairy... 3. C. Gibsonianus.

1. C. reticulatus, Heyne in Wall. Cat. 7724, B in part; Fl. Br. I. 5, 186; Cooke Fl. Pres. Bomb. 2, 599; Trimen Fl. Ceyl. 4, 47; *C. hypoleucos,* Dalz. in Kew Jour. Bot. 3, 123; Dalz. & Gibs. Bomb. Fl. 231. *Panduray,* Vern.

A large shrub with slender branches; young parts and undersides of leaves covered with silvery or ferruginous scales. Leaves ovate-lanceolate, 2·5″-6″ by 1·25″-2″, acute or finely acuminate at the apex, rounded or acute at the base,

thin, glabrous above, densely silvery-lepidote beneath; lateral-nerves about 8 pairs, slender; petioles ·1″-1·5″ long, furnished at the top with 2 divaricate, stipitate glands; stipules subulate, silvery-scaly. Flowers pedicellate, covered with minute silvery scales, in lax, terminal racemes usually shorter than the leaves, the females at the base of the raceme. Male fl. globose in bud, on short, slender pedicels. Sepals ovate-obtuse, ciliolate. Petals shorter than the sepals, obovate-obtuse. Stamens 14-20. Female fl.: Pedicels stouter than in the male. Sepals linear, enlarged in fruit. Ovary reddish-brown, hairy and scaly; styles variable usually bipartite with long slender, unequally bifid arms. Capsule obovoid, about ·5″ long, apiculate, covered with silvery scales and hairs; seeds purplish-brown, mottled with white.

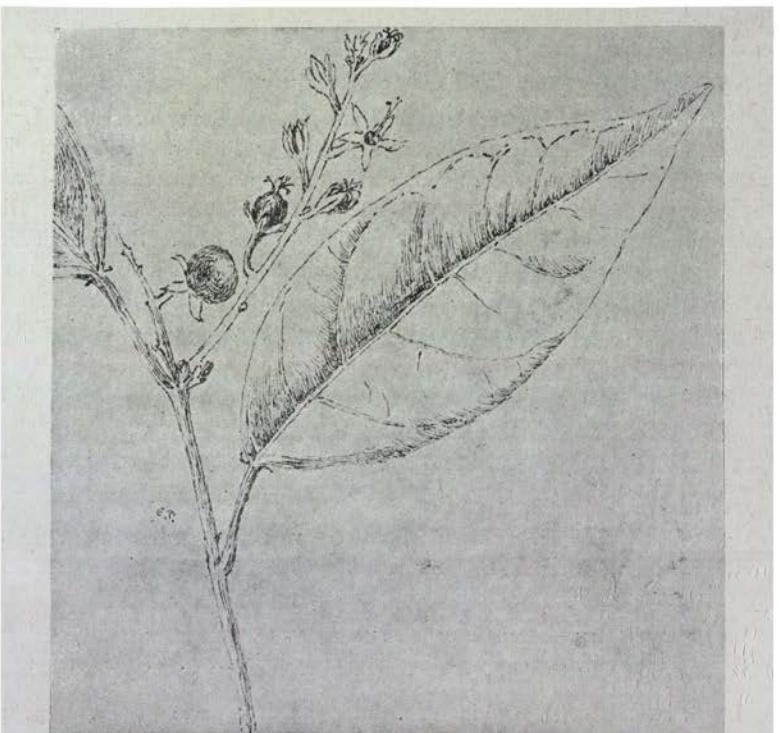

Fig 504. Croton reticulatus, Heyne.

Western peninsula from the Konkan southwards, Ceylon in the moist region up to 3000′, on the Konkan ghâts a rare shrub gregarious near Parle in the Belgaum district in rain-forest. Fl. Jan. Fr. Feb.-Mch.

2. C. oblongifolius, Roxb. Fl. Ind. 3, 685; Fl. Br. I. 5, 387; Brandis For. Fl. 440; Dalz. & Gibs. Bomb. Fl. 231; Bedd. Fl. Sylv. 204; Cooke Fl. Pres. Bomb. 2, 599; Gamble Ind. Timb. 614. *Gunsur.* Vern.

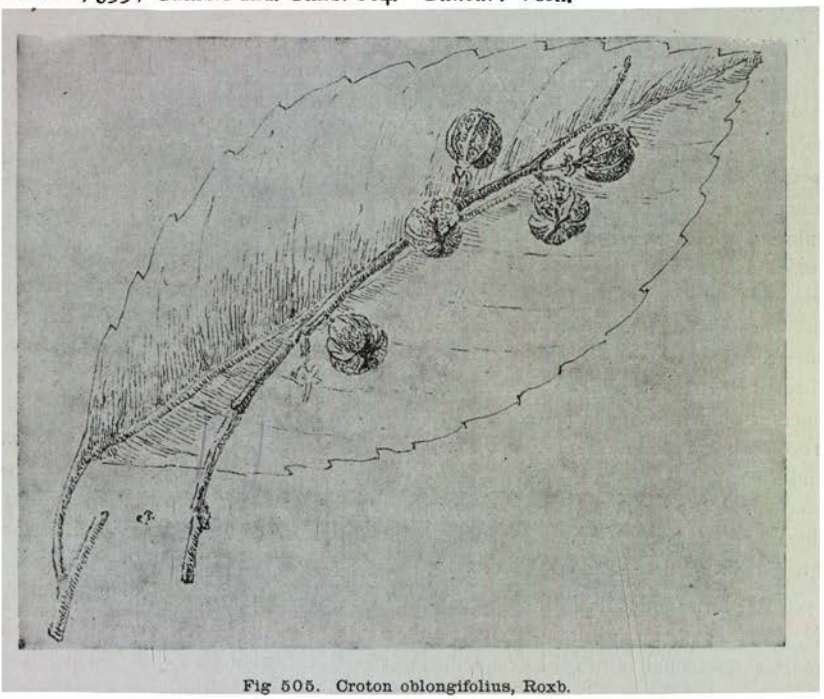

Fig 505. Croton oblongifolius, Roxb.

A small or middle-sized tree; branchlets, flower-buds, ovary, fruit etc. covered with small rounded, silvery scales. Leaves elliptic or oblong-lanceolate, 3″-7″ by 1·75″-2·5″, obtuse or subacute at the apex, acute at the base which is without stipitate glands; margins crenate or serrate, thinly coriaceous, glabrous; lateral-nerves about 12 pairs, slender, distinct; petioles ·5″-1″ long, scaly. Flowers pale yellowish-green, shortly pedicelled, solitary or few-fascicled in slender often fascicled racemes 5″-8″ long; male numerous; female few at the base of the raceme; buds globose; bracts ovate acute sometimes as long as the pedicels. Male fl.: Pedicels variable up to ·15″ long, silvery-scaly. Calyx deeply divided; lobes ovate obtuse. Petals shorter than the calyx-lobes, ovate, obtuse, woolly. Stamens 12, inflexed in bud; filaments hairy below. Female fl.: Pedicels stouter than in the males. Calyx-lobes or sepals triangular acute, densely hairy on the margins. Ovary globose, silvery-scaly, depressed at the top; styles 3 with bifid, curled branches. Capsule depressed-globose, about ·5″ in diameter, densely covered with silvery, orbicular scales; seeds ellipsoid, smooth.

Silhet, Bengal, Chota Nagpur, Central Provinces, Burmah, Ceylon and the Western peninsula. Rare in the Bombay presidency, Konkan "Fort of Banda" Dalz. N. Kanara in rain-forest in the Kumpta taluka near the sea-coast. Fl. C. S. Fr. H. S.

3. C. Gibsonianus, Nimmo. in Grah. Cat. Bomb. Pl. 251; Fl. Br. I. 5, 392; Dalz. & Gibs. Bomb. Fl. 232; Cooke Fl. Pres. Bomb. 2, 600.

A large or small shrub; branchlets stellate-hairy. Leaves elliptic, 3·5-9″ by 1·5″-4, acute or very shortly acuminate at the apex, rounded at the base with 2 divaricate, decurved, stipitate glands at the base, thin, glabrous, covered with minute, white, raised dots on the upper surface; lateral-nerves about 8 pairs, lowest 1-2 pairs basal; venation reticulate, slender; petioles ·5″-1·75″ long, deeply channelled; stipules small, linear, pubescent. Flowers pedicelled, in terminal, stellate-hairy racemes 6″-9″ long; male above; female below; bracteoles minute, linear, hairy. Male fl. on slender pubescent pedicels each about ·25″ long. Calyx divided to the base; sepals ovate obtuse, white-woolly on the margins. Petals smaller than the sepals, membranous. Disk of 5, large, orange glands. Stamens 10 on a hairy receptacle. Female fl. on short, stout, stellately-hairy pedicels at the base of the raceme. Sepals ovate, acute, hairy. Petals 0. Disk saucer-shaped. Ovary globose, densely hairy; styles 3, each divided to the base into 2, linear, reflexed segments. Capsule 3-lobed deeply so at the top ·5″ in diameter, grey stellate-hairy; seeds ovoid about ·3″ long, smooth, brown, blotched with white.

Western peninsula in the Deccan and along the ghâts from the Konkan to N. Kanara; common in rain-forest near the Falls of Gairsoppah, where it is never more than a small shrub. Fl. & Fr. during the C. S. from Nov.-Jan. The short description of the species in Graham's Catalogue is not correct as regards the N. Kanara plant.

C. Tiglium, Linn. Sp. Pl. 1004; Fl. Br. I. 5, 393; Grah. Cat. Bomb. Pl. 181; Brandis For. Fl. 440. *The Purging Croton. Jamalgota, jaipa,* Vern.

A small evergreen tree, cultivated and naturalized in the Konkan probably indigenous in Assam and Eastern Bengal. The elliptic or oblong, membranous, 3-5-nerved leaves are 2″-4″ long. Stamens 15-20. Capsules turbinately ovoid, white, about 1″ long.

The seeds yield a valuable medicinal purgative and blistering, yellowish oil.

C. aromaticus, Linn. and *C. Lawianus,* Nimmo. which were included in my Trees Bomb. (1902) 311, are not described in the present work as there is no evidence that they are indigenous within the limits of the Bombay presidency.

18. GIVOTIA, GRIFF.

A small stellately-tomentose tree. Leaves alternate, cordate, sinuate-toothed, 5-9-nerved at the base. Flowers dicœcious, in axillary or sub-terminal cymes. Disk entire or lobed. Male fl.: Sepals 5, broad, unequal, imbricate. Petals 5, longer than the sepals, connate into a subglobose, 5-lobed corolla. Stamens 13-25, inserted on a woolly receptacle; filaments erect, connate below. Female fl.: Perianth of the male. Disk cupular. Ovary 2-3-celled; ovule solitary in each cell; styles short, bifid, spreading. Fruit a subglobose, 1-seeded drupe; putamen crustaceous. Seed globose; testa bony; albumen fleshy; cotyledons broad, flat.

G. rottleriformis, Griff. in Calc. Jour. Nat. Hist. 4, 388; Fl. Br. I. 5, 395; Brandis For. Fl. 442; Dalz. & Gibs. Bomb. Fl. 228; Bedd. Fl. Sylv. t. 285; Cooke Fl. Pres. Bomb. 2, 602; Gamble Ind. Timb. 615. *Polki,* M.; *Pulkeer,* K.

A small or moderate-sized tree; branches densely white stellately-tomentose. Leaves broadly ovate or rounded, 3"-10" long often as broad or broader, acute or subacute at the apex, widely cordate at the base, coarsely and irregularly dentate, glabrous above when old, densely white or yellowish-tomentose beneath; palmately 5-7 basal-nerved with several pairs of lateral-nerves above the base; petioles nearly as long as the leaves, woolly-tomentose, with a round gland at the top and several about the middle. Flowers in axillary, lax or densely flowered, tomentose cymes near the ends of the branches; pedicels short, jointed; bracts linear, up to ·5" long. Male fl.: Sepals ·15" long, stellately-tomentose, outside. Petals connate, campanulate, longer than the sepals. Disk of 5, orbicular glands. Female fl.: Ovary stellately-hairy. Fruit subglobose, about 1" in diameter, smooth, green, indehiscent; seed globose, purplish.

Western peninsula from Poona southwards, Ceylon in the dry parts of the island; throughout the dry districts of the presidency in deciduous open jungles; common near Sutgutti (Belgaum district) on the lower Cuddapah quartzites. Fl. H. S. Apl.-May.

A small tree, conspicuous on account of its large, white leaves. Bark smooth, brownish, exfoliating in thick, rounded scales which leave deep pits. Wood yellowish-grey with dark streaks and patches, soft and very light. Pores large, scanty, scattered, single or more or less subdivided often in short, radial lines of 2-4 pores together. Medullary rays very fine and numerous, jointed by fine lines of tissue which give a faint reticulated appearance to the wood. Weighs 14 lbs. to the cub. ft. Used for making toys, imitation fruits etc., takes paint readily. The seeds yield a valuable oil used for lubricating fine machinery.

19. BLACHIA, BAILL.

Shrubs or small trees. Leaves alternate or the upper subopposite. Flowers monœcious or dicœcious; male subumbellate; female solitary or fascicled. Male fl.: Sepals 4-5, concave, membranous, imbricate. Petals 4-5 usually smaller than the sepals rounded, hyaline. Disk of 4-5 scales alternating with the petals. Stamens about 15 on a convex receptacle; filaments free; anthers-cells on the margin of the connective. Pistillode O. Female fl.: Sepals 5, imbricate, enlarged in fruit. Petals O. Disk obscure. Ovary 3-4-celled; cells each with a solitary ovule; styles filiform, bipartite, recurved. Capsule 3-lobed consisting of 3, 2-valved cocci, seated on the persistent calyx. Seeds oblong; testa crustaceous; albumen fleshy; cotyledons broad, flat.

B. denudata, Benth. in Jour. Linn. Soc. 17, 226; Fl. Br. I. 5, 403; Cooke Fl. Pres. Bomb. 2, 603; *Croton umbellatum,* Dalz. & Gibs. Bomb. Fl. 231 (exclud. syn.).

A large shrub or small tree; branches brown, glabrous, lenticellate. Leaves very variable, oblong or ovate-lanceolate, 2″-6″ by ·75″-2·5″, acute or shortly acuminate at the apex, often unequal-sided and acute at the base, thinly coriaceous, glabrous, entire; lateral-nerves 6-8 pairs, slender; petioles ·25″-·75″ long. Flowers often dicœcious, axillary or terminal, usually at the ends of the branches; male subumbellate on slender peduncles ·25″-2″ long; female on shorter and stouter peduncles than the male. Male fl. articulated on short, filiform pedicels. Sepals usually 4, orbicular, ·1″ long, thin, imbricate. Petals broadly obovate, much smaller than the sepals, hyaline. Disk of 5, minute scales. Stamens about 15; filaments short, flattened; anthers orbicular with the cells on the margins of the connective. Female fl.: Sepals ovate-lanceolate, accrescent but early caducous. Petals O. Ovary ovoid, obtusely trigonous, glabrous; styles bifid, branches recurved. Capsule subglobose, deeply 3-lobed, ·5″ in diameter of 3, 2-valved cocci; seeds ellipsoid, about ·3″ long, smooth shining, brown, white-mottled, strophiolate.

Western peninsula, apparently endemic in the Konkan and N. Kanara in rain-forest, common on the Supa and Siddapore ghâts. Fl. Oct.-Dec. Fr. Dec.-Feb. A large shrub or small tree up to 30′ in height with a diameter of 3″-6″. Bark smooth, dark-brown. Wood pale yellowish-white, smooth, even-grained and hard. Pores very small, single or in short, radial strings, between the numerous very fine medullary rays which are crossed by faint concentric lines or bands of darker tissue. Weighs about 55 lbs. to the cub. ft.

20. DIMORPHOCALYX, THW.

Trees. Leaves alternate, entire, coriaceous, stipulate. Flowers dicœcious, in axillary or terminal, few-flowered spikes or the female subsolitary. Male fl.: Calyx cupular, 5-toothed or lobed. Petals 5, erect, recurved in the upper part, imbricate. Disk of 5, glandular scales. Stamens 10-12 in 2 rows on a short torus; filaments stout, free or the inner connate in a column; anthers dorsifixed. Pistillode O. Female fl.: Sepals 5, imbricate, greatly enlarged in fruit. Petals 5 as in the male but somewhat larger. Disk annular. Ovary 3-celled; ovule solitary in each cell; styles 3, erect, bifid. Fruit of 3, 2-valved, crustaceous cocci, seated on the persistent, enlarged calyx and crowned with the persistent styles. Seeds ovoid; testa crustaceous; albumen fleshy; cotyledons broad.

D. Lawianus, Hook. f. in Fl. Br. I. 5. 404; Cooke Fl. Pres. Bomb. 2, 604; Gamble Ind. Timb. 616; *Trigonostemon Lawianus,* Muell. Arg. in Linnæa. 34, 212; Bedd. Fl. Sylv. t. 273 (exclud. syn.).

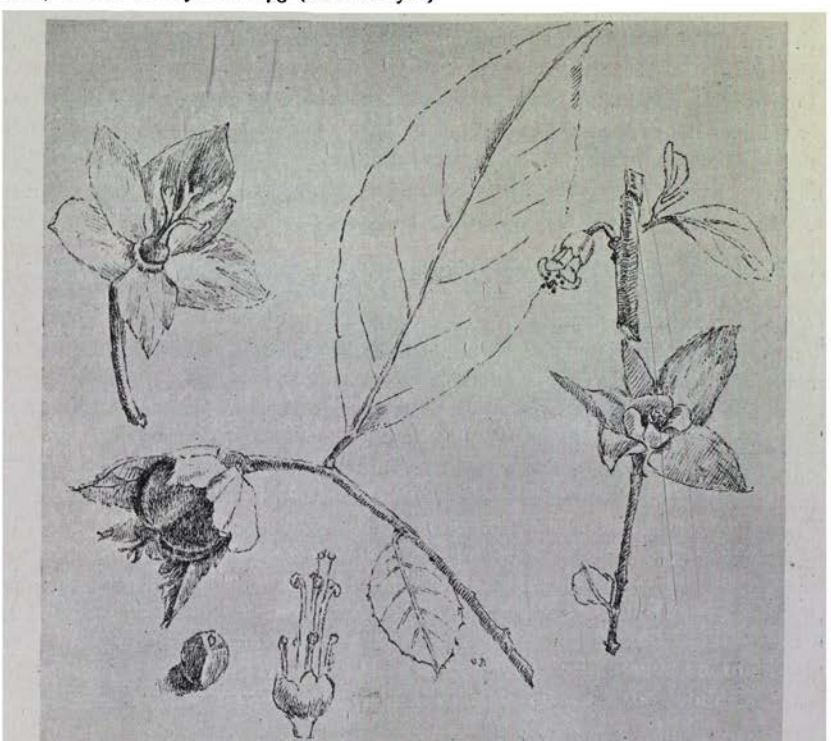

Fig 506. Dimorphocalyx Lawianus, Hook. f.

A small much-branched tree; branches lenticellate. Leaves ovate or elliptic-lanceolate, 3″-6″ by 1″-2·5″, obtuse or shortly acuminate at the apex, obtuse or sub-acute at the base, coriaceous, glabrous, dark-green shining above, pale beneath; margins shallowly repand-dentate; lateral-nerves 8-10 pairs, slender; petioles ·2″-·5″ long, stout, channelled; stipules small, triangular. Flowers diœcious, rarely monœcious; males shortly pedicelled, solitary on the old wood; female long-petioled, solitary or 2-3 together; pedicels bracteate about the middle. Male fl. white, fleshy. Calyx open in bud, ·2″ long; lobes short, rounded. Petals longer than the calyx-lobes, reflexed at the tip. Stamens 10, arranged on a stout, obtuse column ·3″ long. Female fl. very unlike the males. Sepals unequal much longer than the petals, parallel-nerved and reticulately-veined, glandular at the tip. Disk annular, hairy. Ovary densely hairy; styles ·3″ long, connate at the base, twice bifid. Capsule depressed-globose, 3-lobed, about ·5″ in diameter, pubescent; seeds ellipsoid, ·3″ long, yellowish mottled with brown.

Western peninsula from the Konkan to Tranvancore, Konkan ghàts, Khandala, Matheran, Bhimashunkur etc.; common on the Southern ghâts of N. Kanara between Nilkund and Gairsoppah always in rain-forest. Fl. Feb.-Oct. Fr. Nov.-Jan. Usually a small tree. Bark smooth, dark-coloured. Wood (from Poona ghàts), smooth, hard, compact, yellowish with closely set light-brown, broad, incomplete, concentric bands showing mottled on a longitudinal section. Pores small, numerous, equally distributed. Medullary rays fine, short with numerous very fine between. Weighs 48 lbs. to the cub. ft. Scarcely differs from *T. glabellus,* Thw. the Ceylon species.

21. AGROSTISTACHYS, Dalz.

Glabrous shrubs or small trees. Leaves alternate, stipulate, entire or serrate, long. Flowers diœcious, in axillary or supra-axillary, bracteate spikes or racemes; male few or in small clusters within each bract; female solitary, pedicelled. Male fl.: Calyx globose of 2-5, valvate, irregular lobes. Petals 5-8, shorter than the calyx. Disk-glands large, alternating with the petals. Stamens 8-13, inserted on a convex receptacle; filaments free; anthers versatile with the cells pendulous from the thickened connective. Pistillode small, 2-3-fid or O. Female fl.: Sepals 2-4. Petals usually 5, longer than the sepals, caducous. Disk large. Ovary 3-celled; ovule solitary in each cell; styles 3, thick, short, spreading, entire or bifid. Fruit a strongly lobed, tricoccous capsule. Seeds subglobose; albumen fleshy; cotyledons broad, flat.

Leaves strongly serrate. Male flowers minute, solitary in the axils of the densely imbricated small bracts ... 1. A. indica.

Leaves entire. Male flowers numerous in the axils of remote bracts ... ... 2. A. longifolia.

1. **A. indica,** Dalz. in Kew Jour. Bot. 2, 41; Dalz. & Gibs. Bomb. Fl. 232; Fl. Br. I. 5, 406; Bedd. Fl. Sylv. 205; Cooke Fl. Pres. Bomb. 2, 605; Trimen Fl. Ceyl. 4, 55.

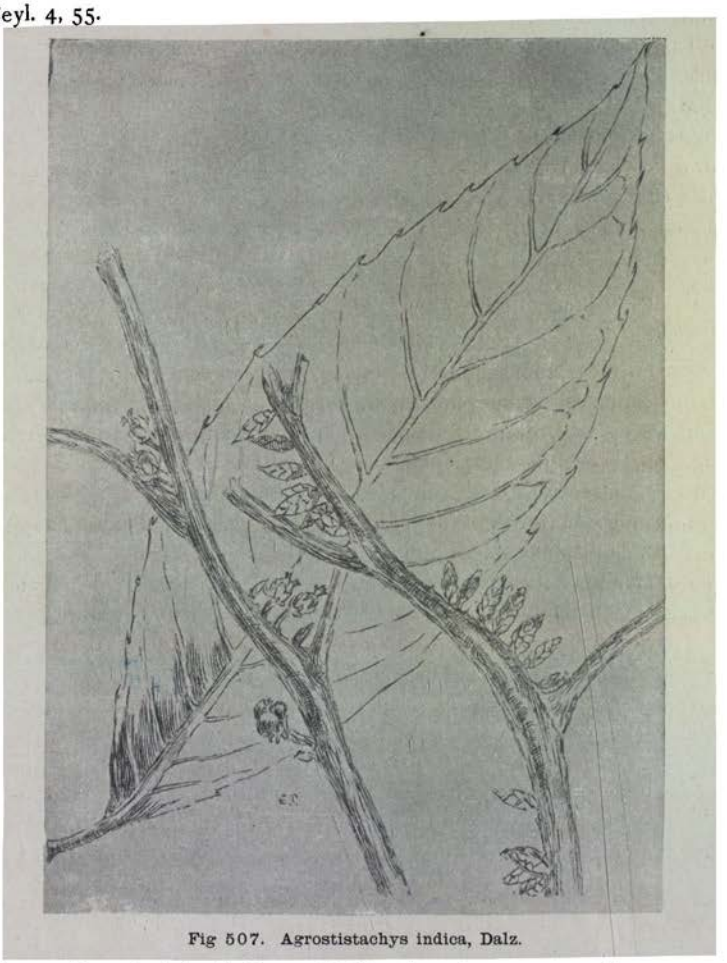

Fig 507. Agrostistachys indica, Dalz.

A stout branched shrub about 5′ high; branches very tough; young parts glabrous. Leaves usually crowded, oblanceolate, 7″-11″ by 2·5″-3·5″, acute at the apex, gradually tapering at the base, distantly sharply serrate with incurved spinulose teeth, coriaceous, glabrous shining; lateral-nerves about 12 pairs usually strong and prominent beneath; with fine, distinct, reticulate venation; petioles more or less winged, ·5″-1·5″ long. Male fl. minute, white, in the axils of small, imbricating bracts forming short, often deflexed, grass-like spikelets arranged in

axillary or supra-axillary fascicles; bracts broadly ovate acute, ciliate. Sepals ovate, membranous. Petals 6-8. Stamens 8-13, longer than the petals. Female fl. solitary, pedicellate; pedicels ·1″ long with 3-5 ovate acute, imbricating bracts at the base. Ovary 3-lobed; styles 3, short, bifid. Disk-glands large, orange. Capsules deeply 3-lobed, about ·5″ in diameter, glabrous, red; seeds globose, pale-brown.

Western peninsula on the ghâts from the Konkan southwards. Ceylon (Central Provinces) up to 2000′; throughout the Konkan, Southern Mahratta Country (Belgaum) and N. Kanara in rain-forest and along the banks of streams and nallahs. Fl Feb. Fr. C. & H. S. Nowhere a common species.

2. **A. longifolia,** Benth. in Gen. Plant. 3, 303; Fl. Br. I. 5, 407; Cooke Fl. Pres. Bomb. 2, 605; Gamble Ind. Timb. 616; Trimen Fl. Ceyl. 4, 56; *Sarcoclinum longifolium,* Wight Ic. tt. 1887-8; Bedd. Fl. Sylv. 205.

A small tree; branches terete, glabrous, marked with the scars of the fallen leaves and stipules; young parts yellow-resinous. Leaves oblanceolate, 10″-24″ by 2″-4″, very shortly obtusely acuminate at the apex, gradually tapering into the petiole, coriaceous, leathery, glabrous; lateral-nerves 15-20 pairs; prominent beneath; petioles ·25″-1″ long; stipules short, broad, caducous. Flowers in lax, spikate racemes shorter than the leaves; males 1-4-clustered in the axils of ovate bracts; female distant along the rachis on articulated pedicels. Male fl.: Calyx ·12″ long, membranous; sepals 2-3, entire. Petals 5, small. Disk-glands very large. Stamens about 10. Female fl.: Sepals 5. Petals 3. Disk very large, lobed. Ovary hairy; styles spreading. Capsule about ·3″ in diameter; cocci globose, dark-brown, glabrous; seeds globose, smooth, brown.

Western peninsula from N. Kanara to the Nilgiris, Travancore and Ceylon (montane zone 3′-6000′, common); N. Kanara on the Supa ghâts along streams in rain-forest, a somewhat rare species. "Wood light-brown, moderately hard. Pores small, in radial strings between the fine and numerous, indistinct, medullary rays." Gamble. The stiff hard leaves are used for thatching roofs of huts in Ceylon and are stated to be durable.

22. BALIOSPERMUM, Blume.

Shrubs. Leaves alternate, sinuate-toothed or lobed, penninerved or 3-5 basal-nerved and with 2 glands at the base. Flowers small, monœcious or dicœcious, in panicles or racemes. Perianth simple. Male fl.: Buds globose. Sepals 4-6, membranous, concave, imbricate. Disk of 4-6 glands. Stamens 10-30 inserted on a small receptacle; filaments free or a few connate; anthers terminal with the cells adnate to the broad connective, dehiscing by lateral slits, at first introrse. Pistillode usually obsolete. Female fl.: Sepals 5-6, ovate-lanceolate,

entire or toothed, sometimes accrescent in fruit. Disk entire. Ovary 3-celled; cells each with a solitary ovule; styles long, stout, bifid or bipartite; stigmas smooth. Capsule of 3, 2-valved, crustaceous cocci. Seeds ovoid; testa crustaceous; albumen fleshy; cotyledons broad and flat.

B. axillare, Blume Bijdr. 604; Fl. Br. I. 5, 461; Cooke Fl. Pres. Bomb. 2, 608; *B. polyandrum,* Wight Ic. t. 1885; Dalz. & Gibs. Bomb. Fl. 232. *Danti, jamalgota,* Vern.

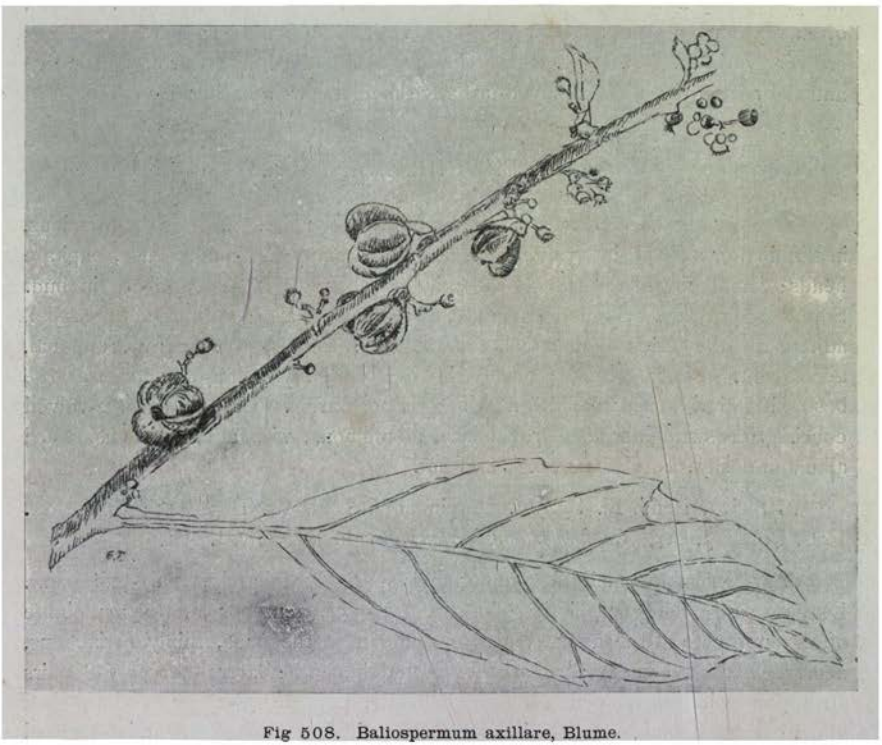

Fig 508. Baliospermum axillare, Blume.

A stout branched undershrub; young shoots pubescent. Leaves ovate or the upper palmately 3-5-lobed or small lanceolate, 3″-12″ long and often nearly as broad, cuneate or rounded and biglandular at the base, sinuate-toothed; lobes acute at the apex, palmately 3-5-nerved or the ovate leaves penninerved, glabrous above, more or less pubescent and strigose beneath; petioles 1″-6″ long, pubescent; stipules of 2 glands. Flowers in long, axillary or terminal, interrupted racemes or contracted panicles mostly male with a few female; bracts small. Male fl. minute. Calyx globose; sepals 4-6, pubescent; lobes suborbicular,

mottled. Disk of 6, soft, lobulate glands. Stamens about 15. Female fl. subsessile. Sepals ovate-lanceolate, pubescent, not accrescent. Disk thin, cupular, crenate. Ovary densely strigose; styles short, thick, bipartite, dull-red; arms recurved; stigmatic surfaces smooth. Capsule obovoid, ·5″ long, on stout deflexed pedicels, 3-lobed consisting of 3, 2-valved, crustaceous cocci; seeds ellipsoid, ·3″ long, smooth, mottled.

Tropical India, Bengal, Assam, Burmah, Western peninsula; throughout the presidency in the dry open Deccan plains or in monsoon-forest in N. Kanara, often reproduced by means of root-suckers. The size and shape of the leaves are very variable. Fl. & Fr. C. S. The seeds are used as a strong purgative and the roots are much employed in native medicine as a cathartic.

23. ADENOCHLÆNA, Baill.

Trees or shrubs. Leaves alternate, entire, stipulate. Flowers monœcious, in terminal or axillary, interrupted spikes; males many in small, dense, capitate heads; female few at the base of the spikes. Disk O. Male fl. globose in bud. Sepals 4-6, valvate. Stamens 4-6 exserted; filaments free; anthers-cells parallel, adnate to the thick connective. Female fl.: Sepals 5-8, narrow, unequal, accrescent. Ovary 3-celled; ovule 1 in each cell; styles long, connate at the base, bifid above, recurved with multifid, plumose arms. Capsule of 3, 2-valved cocci. Seeds subglobose, estrophiolate, albuminous, with a crustaceous testa; albumen fleshy; cotyledons broad and flat.

A. indica, Bedd. Fl. Sylv. t. 261 in adnot.; Fl. Br. I. 5, 418; Cooke Fl. Pres. Bomb. 5, 613; *Cephalocroton indicum*, Bedd. Fl. Sylv. t. 261.

A large shrub or small tree; young parts sparingly stellately, mealy-pubescent. Leaves ovate-oblong or elliptic, 3″-7″ by 1·5″-3·5″, acute or shortly acuminate often mucronate at the apex, acute or rounded at the base, thinly coriaceous, nearly glabrous, sometimes obscurely dotted beneath; lateral-nerves 6-8 pairs strong and with conspicuous venation beneath; petioles ·5″-2″ long, channelled above; stipules small. Flowers in lateral or terminal, mealy-pubescent, interrupted spikes 2″-6″ long; male numerous, in small, compact, capitate heads; female few at the base of the spike; bracts minute. Male fl. globose in bud, about ·1″ in diameter. Sepals valvate. Stamens 4 round the base of the filiform obscurely lobed pistillode, exserted. Female fl.: Sepals lanceolate, imbricate and often glandular at the base. Disk O. Ovary tomentose; styles 3, united at the base into a short or elongated column, free and spreading above, each divided into 2 bifid, papillose-asperous arms. Capsule subglobose, tricoccous, ·75″ in diameter, slightly scabrous.

Western peninsula on the ghâts from N. Kanara to Travancore up to 4000′, fairly abundant in rain-forest near the Falls of Gairsoppah. Fl. Oct.-Dec. Usually a small tree or shrub with whitish, smooth bark. "Wood strong and useful for building purposes." Bedd.

24. TREWIA, LINN.

Soft-wooded trees. Leaves opposite, broadly ovate or orbicular, cordate, entire, 3-5 basal-nerved, sometimes glandular. Flowers dicœcious, small; male in lax, bracteate, axillary racemes; female long-pedunculate, solitary or racemose. Perianth simple. Disk obsolete. Male fl.: Calyx globose, splitting into 3-4, concave often reflexed segments. Stamens numerous, free on a central, depressed, convex torus; anthers dorsifixed. Pistillode 0. Female fl.: Calyx of 3-5 broad, imbricate, caducous sepals. Ovary 3-4-celled; cells each with a solitary ovule; styles long, undivided, connate at the base. Fruit a fleshy drupe, indehiscent or the endocarp loculicidal. Seeds albuminous; testa hard; cotyledons broad, flat.

Female flowers solitary or 2-3 together. Fruit globose, 1·5″ in diameter, woody, indehiscent ... ... 1. T. nudiflora.

Female flowers numerous, in short racemes. Fruit ovoid, ·25″ long; endocarp thin, loculicidal ... ... 2. T. polycarpa.

T. nudiflora, Linn. Sp. Pl. 1193 *(Trevia);* Fl. Br. I. 5, 423; Brandis For. Fl. 443; Dalz. & Gibs. Bomb. Fl. 231; Cooke Fl. Pres. Bomb. 2, 614; Gamble Ind. Timb. 617. *Petari,* Vern. *Tumri, shillauri, kat-kumbla,* K.

A middle-sized or large deciduous tree; shoots, inflorescence and sometimes the leaves beneath clothed with flocculent cottony wool, sometimes glabrescent. Leaves ovate, 4″-6″ by 2·5″-5″, acuminate at the apex, cordate or rounded sometimes with 2 glands at the base, thin, glabrous, bright-green above, 3-5 basal-nerved, the midrib penninerved; petioles 3″-4″ long. Flowers ⅓″ in diameter, greenish-yellow. Male fl. with slender, short pedicels, in racemes 3″-7″ long. Sepals concave, valvate. Stamens many. Female fl. solitary or 2-3 together on long peduncles. Sepals 3-6, membranous, broad, imbricate, caducous. Ovary woolly; styles ·5″ long, yellow. Drupe depressed-globose, nearly woody, about 1·5″ in diameter; seeds rounded on the back, angular on the face, dark-brown, polished.

Hotter parts of India from Kumaon southwards and eastwards to Ceylon and Assam; throughout the Konkan and N. Kanara in moist monsoon-forest often along nallahs and in swampy localities. Fl. Dec.-Feb. Fr. R. S. Bark grey, smooth. Wood white and soft. Pores moderate-sized, subdivided, often elongated. Medullary rays fine, closely packed and uniform. Weighs 29 lbs. to the cub. ft. "Used for making native drums. The wood must be cut up when green and seasoned in dry air otherwise it gets discoloured." Gamble.

2. T. polycarpa, Benth. in Gen. Plant. 3, 319; Fl. Br. I. 5, 424; Cooke Fl. Pres. Bomb. 2, 614; *T. nudiflora*, Wight. Ic. t. 1871 (female fl. only); Bedd. Fl. Sylv. t. 281 (female fl. only).

A large deciduous tree; young parts grey-pubescent. Leaves opposite, broadly ovate, 6"-8" by 5"-7", acuminate at the apex, rounded or subcordate and with 2 stipitate glands at the base, thin, glabrous or nearly so; 3-5 basal-nerved, midrib penninerved; petioles 1·5"-3" long. Male fl. sessile or shortly pedicelled, in short, slender racemes. Calyx globose in bud, slightly pubescent, red, irregularly 3-lobed. Stamens numerous; filaments short; anthers large. Pistillode O. Female fl. on short, stout, pubescent pedicels, in 4-8-flowered, axillary racemes. Calyx longer than the ovary, splitting along one side, shortly 3-lobed at the top. Ovary ovoid, densely grey-tomentose; styles long, connate at the base, papillose all over. Fruit globosely ovoid, ·5' long, densely grey-tomentose; pericarp crustaceous, loculicidal; seeds rounded at the back with a flat face, smooth.

Western peninsula, Konkan. Fl. C. S. (Nov.) A very rare tree. The only specimens I have seen were collected near Masrud in the Tannah district.

25. MALLOTUS, Lour.

Trees or shrubs. Leaves alternate or opposite, penninerved or 3-7 basal-nerved, often glandular-dotted beneath, entire or lobed, sometimes peltate. Flowers small, usually dicœcious, in terminal racemes or spikes; male clustered; female solitary in the axils of the bracts. Perianth simple. Male fl.: Calyx globose or ovoid, valvately 3-5-partite. Disk O. Stamens numerous, free or connate at the base on a central torus; anthers small, dorsifixed, cells often widely separated by the thickened connective. Pistillode O or very minute. Female fl.: Calyx spathaceous or valvately 3-6-lobed or partite. Ovary 2-5-celled; cells each with a solitary ovule; styles as many as the ovary cells, simple or connate at the base, plumose or papillose. Fruit a dry capsule of 2-5 echinate, paleaceous or smooth often softly spinous cocci. Seeds albuminous; cotyledons flat.

Erect trees. Leaves usually alternate.

Capsule 3-4-coccous, muricate with soft, tomentose processes ... ... 1. M. albus.

Capsule tricoccous covered with crimson, resinous powder ... ... 2. M. philippinensis.

Erect shrubs. Leaves opposite.

Capsule tricoccous, covered with soft, ultimately hard, scattered tubercles ... ... 3. M. stenanthus.

Capsule 3-4-coccous, covered with soft, scattered, villous filaments ... ... 4. M. Lawii.

Scandent shrub. Capsule tricoccous, stellately tomentose ... ... 5. M. repandus.

1. M. albus, Muell. Arg. in Linnæa 34, 188; Fl. Br. I. 5, 426 (Var. *occidentalis*, Hook. f.); Brandis For. Fl. 444; Bedd. Fl. Sylv. 208; Cooke Fl. Pres. Bomb. 2, 615; Gamble Ind. Timb. 619; *Rottlera mappoides,* Dalz. in Kew Jour. Bot. 3, 122; Dalz. & Gibs. Bomb. Fl. 230.

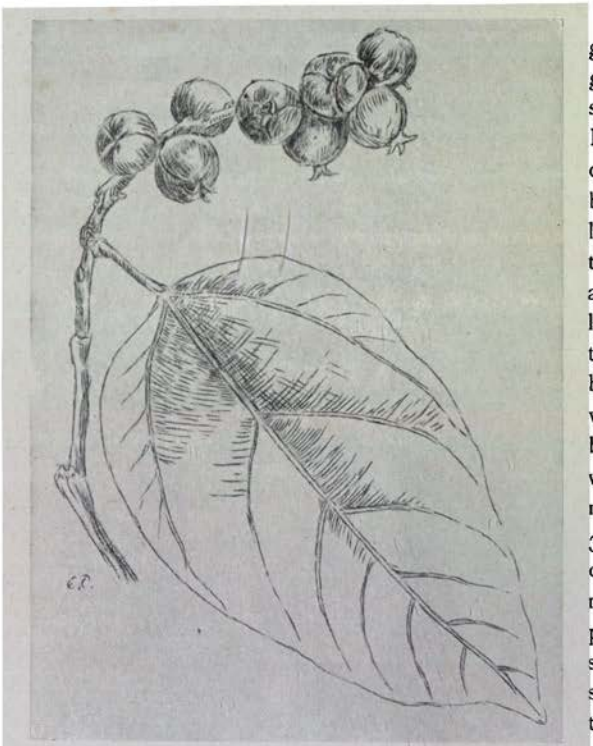

Fig. 509. Mallotus philippinensis, Muell. Arg.

A moderate-sized evergreen tree; branches grooved; young parts grey stellately-tomentose. Leaves variable, broadly ovate or orbicular, 4″-8″ by 4·5″-6″, entire or shallowly 3-lobed; lobes acute, terminal-lobe acuminate at the apex, truncate, shallowly cordate or subpeltate, biglandular at the base, dark-green above, whitish or rusty-tomentose beneath, 5 basal-nerved, with 3-4 pairs of lateral-nerves above; petioles 3″-8″ long. Flowers dicecious, in axillary and terminal, rusty-tomentose panicled-spikes; males in sessile heads on elongated spikes; female larger than the male solitary on shorter spikes; bracts triangular-ovate, small. Male fl. globose in bud, ·12″ in diameter. Sepals usually 4, ovate-lanceolate, rusty scaly-tomentose. Stamens about 80; filaments slender; anther-cells parallel. Female fl.: Calyx deeply unequally 4-5-lobed. Ovary 4-celled, densely rusty-tomentose, ultimately softly echinate; styles flat, very papillose. Capsule globose, about ·5″ in diameter, subsessile, tetracoccous, echinate with soft, woolly, white or

rusty-tomentose spines ; seeds rounded at the back with an angular face, brown, shining, rugose.

Sikkim, Eastern Bengal, Assam, Western peninsula from the Konkan to Ceylon; throughout the Konkan and N. Kanara mostly sparsely distributed in monsoon and rain-forest. Fl. Sept.-Oct. Fr. ripe Nov.-Feb. A moderate-sized, conspicuous tree up to 60′ high and 1·5′ in diameter. Bark thin, pale-whitish, smooth with a green layer inside, without rhytidome. Wood soft and white. Pores large and moderate-sized, often subdivided. Medullary rays fine and very fine, closely packed, equidistant. Weighs about 30 lbs. to the cub. ft.

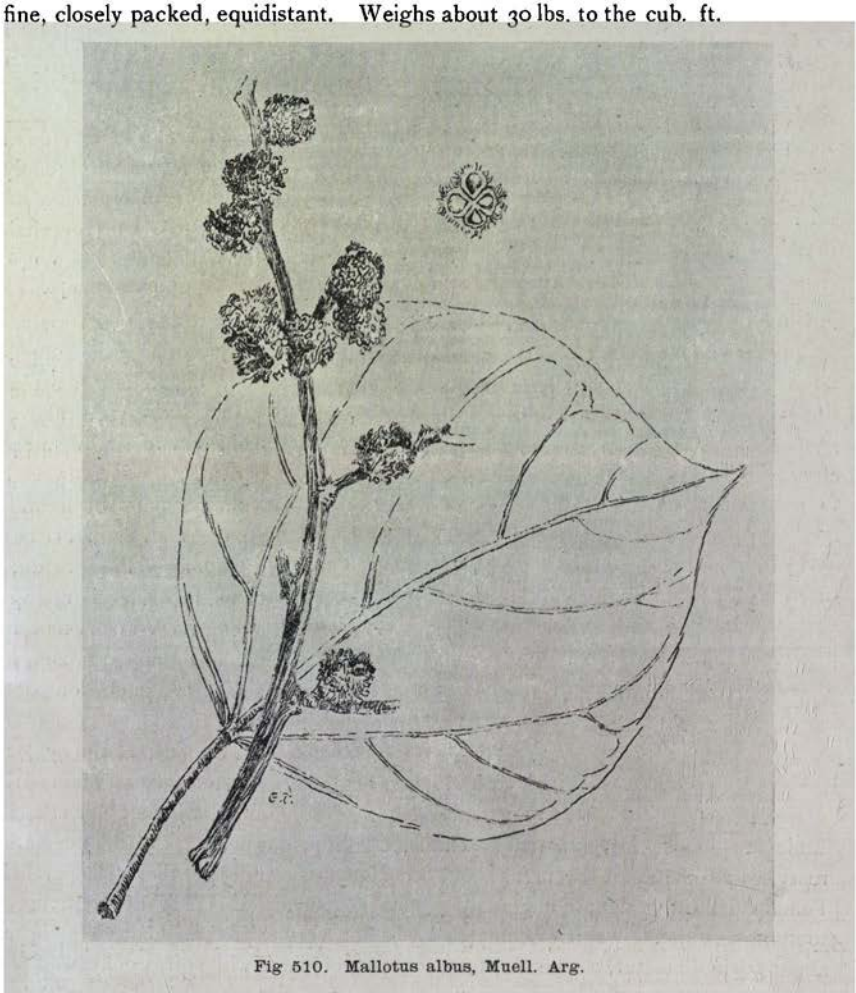

Fig 510. Mallotus albus, Muell. Arg.

2. M. philippinensis. Muell. Arg. in Linnæa 34, 197; Fl. Br. I. 5, 442; Brandis For. Fl. 444; Bedd. Fl. Sylv. t. 289; Cooke Fl. Pres. Bomb. 2, 619; *Rottlera tinctoria,* Roxb. Cor. Pl. 2, 36, t. 167; Dalz. & Gibs. Bomb. Fl. 230; Grah. Cat. Bomb. Pl. 184. *The Monkey-face Tree. Ruhin, shendri, kamela, kapila,* Vern. *Kunkuma,* K. *Shendrya,* Bhil.

A small tree often with a buttressed trunk; branchlets and young parts fulvous-pubescent. Leaves alternate, variable, ovate-lanceolate, 3″-7″ by 1·25″-2·5″, acuminate at the apex, rounded or acute at the base, entire or repand-toothed, coriaceous, glabrous above, rather stiff when mature, pale pubescent and covered with crimson glands on the lower surface, strongly 3 basal-nerved with 4-6 pairs of prominent lateral-nerves above the base; petioles 1″-2″ long, fulvous-pubescent and with 2, small, sessile glands at the top. Flowers diœcious, small; males globose in bud, sessile in clusters, arranged in erect, terminal, single or fascicled spikes longer or shorter than the leaves; bracts minute, linear; females sessile or shortly pedicelled, in short spikes or racemes. Male fl.: Sepals usually 4, lanceolate-acute, ·12″ long. Stamens numerous, exserted. Female fl.: Calyx with 3-4 ovate-lanceolate sepals thicker than those of the male. Ovary glandular; styles 3, simple, papillose. Capsule globose, ·3″ in diameter, 3-lobed, loculicidally 3-valved, covered with an easily detachable scurf of red, resinous particles soluble in ether or alcohol; seeds small, subglobose, black.

Tropical India, Burmah, Malaya, China, Australia; throughout the Western peninsula; low country of Ceylon up to 2500′ in both the dry and moist regions; common throughout the presidency and Sind in mixed monsoon or open thorn-forest, often gregarious. One of the most widely distributed species. Fl. Nov.-Jan. Fr. ripe Feb.-May. Bark thin, grey, irregularly cracked; inner-bark red. Wood reddish-grey, hard, close-grained and smooth. Pores small, scanty, equally distributed. Medullary rays fine and very fine, closely packed. Weighs 54 lbs. to the cub. ft. The wood is only used for fuel. The red, resinous powder from the surface of the capsules yields the valuable and well known *Kamela* dye employed for colouring silk fabrics; it is also used in native medicine as an anthelmintic in cases of tape-worm and for curing itch. The bark contains tannin.

3. M. stenanthus, Muell. Arg. in Linnæa 34, 191; Fl. Br. I. 5, 437; Cooke Fl. Pres. Bomb. 2, 616; Bedd. Fl. Sylv. 209.

A small shrub; branchlets and young parts covered with yellow, transparent, resinous glands. Leaves opposite, glandular, ovate-lanceolate, 3″-5″ by 1″-2″, obtusely acuminate at the apex, usually acute at the base, sinuate-toothed, glabrous shining above, glandular-dotted beneath; lateral-nerves 5-7 pairs distinct beneath with raised, reticulate venation between the nerves; petioles ·25″-·6″ long. Flowers in slender, axillary or terminal spikes or racemes 1″-3″

long; male sessile or shortly pedicelled, fascicled along the rachis, ovoid in bud, covered with yellow, resinous glands; female larger than the male, shortly pedicelled, usually solitary on the rachis which is often 6″ long; bracts minute, triangular-ovate. Male fl. minute. Calyx divided into 4, lanceolate sepals covered with yellow glands. Stamens about 20; filaments short, stout. Female fl. on stout pedicels ·2″ long, slightly thickened upwards. Calyx ·25″ across; sepals lanceolate, connate at the base. Ovary 3-lobed, densely softly echinate; styles free or slightly connate, plumose, recurved. Capsule 3-coccous, ·5″ in diameter, deeply 3-lobed, covered with golden, shining glands and sparsely echinate, crowned with the plumose styles; seeds globose, smooth.

Western peninsula in the rain-forests of N. Kanara from Yellapore southwards also found in the Konkan, apparently endemic. Fl. Sept.-Jan. Fr. ripe H. S. (Apl.-May.) A small evergreen shrub common in the undergrowth of many of the N. Kanara Kans.

4. M. Lawii, Muell. Arg. in Linnæa 34, 192; Fl. Br. I. 5, 438; Bedd. Fl. Sylv. 209; Cooke Fl. Pres. Bomb. 2, 617; *Rottlera aureopunctata,* Dalz. in Kew Jour. Bot. 3, 122; Dalz. & Gibs. Bomb. Fl. 210.

A small shrub; branchlets mealy-pubescent or tomentose. Leaves opposite, elliptic-lanceolate, 3″-7″ by 1″-2·5″, obtusely or acutely acuminate at the apex, acute or cuneate at the base, repand-dentate, thin, glabrous shining above, yellow resinous glandular-dotted beneath; lateral-nerves 6-8 pairs prominent beneath with strong, reticulate venation between the nerves; petioles ·25″-·5″ long; stipules small, triangular-acute. Flowers in slender racemes 2″-4″ long; bracts small, linear, pubescent; male small, tomentose, globose in bud, pedicelled or sessile, in small, few-flowered, distant fascicles along the rachis; female solitary, on short, stout, pubescent pedicels. Male fl.: Sepals 3-4, ovate-acute, grey-villous. Stamens numerous about 50; filaments short. Female fl. in few-flowered racemes. Calyx spathaceous, ·25″ long, splitting into 5-6 lanceolate, unequal, tomentose lobes. Ovary globose, densely covered with soft, hairy filaments; styles free or shortly connate at the base, divided above into reflexed, plumose lobes. Capsule 3-4-coccous, ·5″ in diameter, densely covered with long villous filaments; seeds globose, smooth shining.

Western peninsula; thoughout the Konkan and N. Kanara in rain-forest, common in the undergrowth near the Devimone and Nilkund ghâts, apparently endemic. Fl. Oct.-Dec. Fr. ripe Feb.-Mch. A small, evergreen shrub.

5. M. repandus, Muell. Arg. in Linnæa 34, 192; Fl. Br. I. 5, 442; Brandis For. Fl. 444; Bedd. Fl. Sylv. 210; Cooke Fl. Pres. Bomb. 2, 617; Trimen Fl. Ceyl. 4, 67; *Rottlera dicocca,* Roxb. Fl. Ind. 3, 829; Dalz. & Gibs. Bomb. Fl. 230.

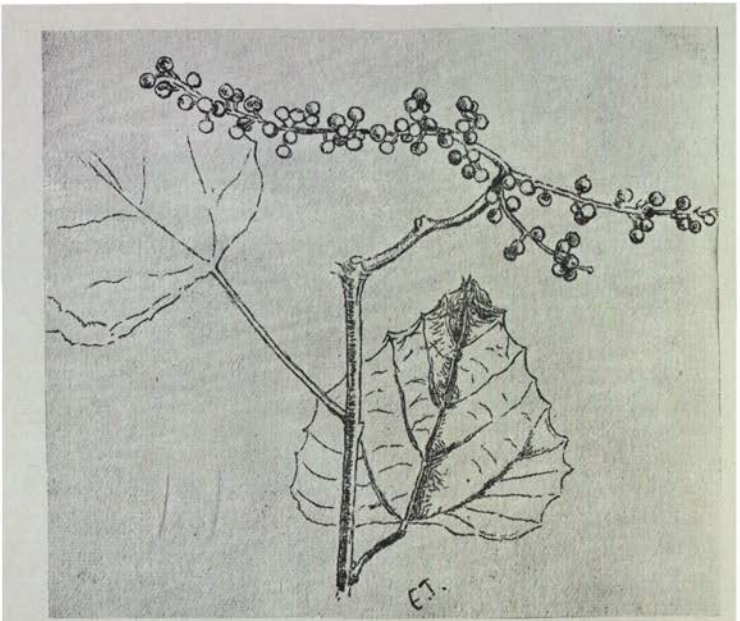

Fig 511. Mallotus repandus, Muell. Arg.

A large and extensively climbing or scandent, spinous shrub; branchlets tawny-tomentose. Leaves alternate, broadly deltoid-ovate, 2″-3·5″ by 1·5″-3″, acuminate at the apex, truncate or subacute at the base, entire or sinuate-toothed, sparsely stellately-pubescent above, densely fulvous-tomentose and glandular beneath; 3 basal-nerved with 3-4 pairs of lateral-nerves above joined by parallel venation; petioles 1″-2″ long, slender; stipules minute. Flowers greenish-yellow, in terminal or axillary, lax, simple or branched racemes 4″-6″ long; bracts linear, caducous. Male fl. globose, ·1″ in diameter, fulvous-tomentose, shortly pedicellate. Sepals 5, ovate-acute, deflexed. Stamens very numerous; filaments filiform; anther-cells at different levels on the connective. Female fl. long-pedicelled, bracteate. Calyx deeply divided into 5 lanceolate segments; tube short. Ovary 2-celled; styles short, plumose. Capsule didymous, ·5″ in diameter, densely stellately-tomentose; seeds globose, black.

Tropical India from the Himalaya to Ceylon, Bengal, Burmah, Assam, China, Malaya and New Caledonia; Western peninsula, throughout the Konkan and N. Kanara in rain-forest, common in the South Konkan also near Yellapore in N. Kanara. Fl. Sept.-Oct. Fr. ripe C. S. Stems thick, fluted, with a white scaly

bark, very rough at the base of the stems; inner-bark yellowish, fibrous. The spines on the stems are 1″-3″ long either single or 3-4 from a raised tubercle.

26. CLEIDION, Blume.

Glabrous trees. Leaves simple, alternate, penninerved. Flowers monœcious or dicœcious; male in long, axillary racemes; female larger than the males, usually solitary on a long, axillary penducle. Perianth simple. Male fl.: Calyx globose, 3-5-partite; segments valvate. Stamens numerous, crowded on a conical, central receptacle; anthers 4-celled, peltately attached; connective broad, produced. Pistillode O. Female fl.: Sepals 3-5, imbricate. Ovary 2-3-celled; cells each with a solitary ovule; styles 2-cleft with long, filiform arms. Capsule 2-3-coccous. Seeds subglobose; testa coriaceous; albumen fleshy; cotyledons broad and flat.

C. javanicum, Blume Bijdr. 613; Fl. Br. I. 5, 444; Bedd. Fl. Sylv. t. 272; Cooke Fl. Pres. Bomb. 2, 618; Trimen Fl. Ceyl. 4, 69; *Rottlera uranda*, Dalz. in Kew Jour. Bot. 3, 220; Dalz. & Gibs. Bomb. Fl. 230.

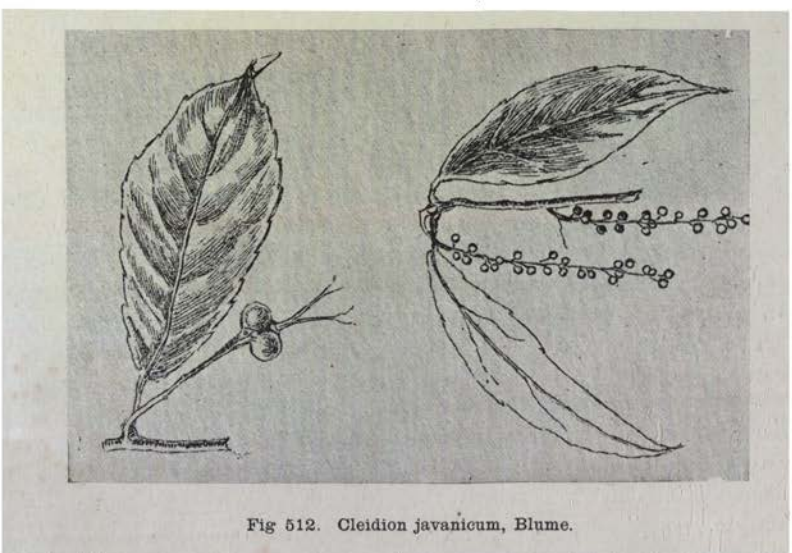

Fig 512. Cleidion javanicum, Blume.

A glabrous evergreen moderate-sized tree; branches lenticellate. Leaves alternate or subopposite, ovate or lanceolate, 3″-6″ by 1·25″-2″, acuminate at the apex, acute at the base, serrate or subentire, coriaceous, glabrous, dark-green above, paler beneath; petioles slender, thickened at the top, 1″-1·5″ long, slender. Male fl. shortly pedicelled, globose in bud, in long, axillary racemes, very small. Sepals 3-4, acute, reflexed. Anther-cells, short, didymous. Female fl. on long

axillary peduncles 2″-4″ long. Sepals 3-5, short, imbricate. Ovary globose, slightly 2-lobed; styles 2, very long, each divided into 2, filiform arms. Capsule large, 2-lobed, about 1″ across, crowned with the persistent styles; lobes of capsule nearly globose each splitting into 2 valves; seeds globose, nearly ·5″ in diameter, grey with brownish spots.

Sikkim-Himalaya to Burmah, Penang and the Andamans, Ceylon, in the moist region up to 2000′, Western peninsula from the Konkan to Travancore; Konkan and N. Kanara in rain-forest, common near the Ainshi ghát. Fl. Oct.-Dec. Fr. Jan.-Feb. Bark grey, rough with a powdery surface of small raised corky cells; inner-bark thick, hard, yellowish. Wood white or yellowish, rather heavy, close-grained, fibrous and soft, not durable. Used in Madras for building purposes. The seeds are arillate when young.

27. MACARANGA, THOUARS.

Trees or shrubs. Leaves alternate, large, peltate, entire or lobed, more or less glandular beneath, 3-5 basal-nerved; stipules large, caducous. Flowers dicœcious, in racemes, panicles or spikes; male many, clustered in dense, sessile heads; female 1 or few under each bract; bracts often large, entire or toothed. Perianth simple. Male fl. minute. Calyx globose, divided into 3-4 valvate sepals. Disk wanting. Stamens 2-30, often central on a convex receptacle; filaments short, free; anthers 3-4-celled, peltately attached. Pistillode 0. Female fl.: Calyx 2-4-lobed or toothed. Ovary 2-6-celled; cells each with a solitary ovule; styles thickly papillose, entire. Capsule small, of 1-5, 2-celled cocci often waxy glandular. Seeds globose; albumen fleshy; cotyledons broad and flat.

M. tomentosa, Wight Ic. t. 1949 fig. 1; Bedd. Fl. Sylv. t. 287; Cooke Fl. Pres. Bomb. 2, 619; Trimen Fl. Ceyl. 4, 70; M. *Roxburghii*, Wight Ic. t. 1949 fig. 4; Fl. Br. I. 5, 448; Dalz. & Gibs. Bomb. Fl. 228; Talb. Trees Bomb. 317; Gamble Ind. Timb. 621; *Osyris peltata*, Roxb. Fl. Ind. 3, 755; Grah. Cat. Bomb. Pl. 177. *Chandoda*, M. *Chandkal*, K. *Chandori*, Kon. *Chanda*, Vern.

A large or middle-sized resinous tree; branchlets stout, tomentose, green and glaucous marked with the scars of the fallen leaves and stipules. Leaves peltate, broadly ovate, or deltoid-ovate, 5″-7″ by 3·25″-5·5″, acute, cuspidate or acuminate at the apex, rounded at the base, glabrous dark-green above, more or less pubescent, gland-dotted and paler beneath; basal-nerves numerous, slender with 6-9 pairs of strong lateral-nerves above; petioles 3″-6″ long, cylindrical, glabrous; stipules large, ovate, acuminate, reflexed, caducous. Male fl. minute, greenish, in interrupted, dense, sessile, bracteate heads arranged in axillary, rusty-tomentose panicles or on the branches below the leaves usually shorter than the petioles; bracts broader than long, toothed and

veined; bracteoles concave. Sepals 3, minute, obovate. Stamens 2-5. Female fl. on shorter and simpler panicles than in the male and with larger bracts. Calyx-limb obsolete. Ovary 1-celled, exserted, densely glandular; styles large, lateral, peltate. Capsule globose, ·25" in diameter, densely covered with waxy resinous glands.

Hills of the Deccan peninsula and Circars; Western peninsula along the ghâts from the Konkan to Travancore in rain-forest, Ceylon up to 3000'; throughout the Konkan and N. Kanara very common. Fl. Feb.-Mch. Fr. Apl.-May.

Usually a large tree of quick growth in the N. Kanara forests. Bark dark-grey, nearly smooth, covered with scattered masses of corky cells; inner-bark bright-red with patches of white tissue. Wood grey or reddish, smooth, soft and light. Pores moderate-sized or small, often subdivided. Medullary rays very fine, numerous, indistinct, giving a slight silver-grain to the timber. Weighs about 26 lbs. to the cub. ft. A light, crimson-coloured gum exudes from wounds in the stem, used in native medicine and for taking seal impressions. The timber is unsuitable for firewood and is rejected as such by the local Southern Mahratta railway company which employs wood fuel.

M. indica, Wight Ic. t. 1883 and 1949, f. 2 is not described in the present work as there is no evidence to show that it is found within the limits of the Bombay presidency; it is common in the evergreen sholas on the Nilgiris and along the Western ghâts of the Madras presidency.

28. HOMONOIA, Lour.

Rigid shrubs. Leaves alternate, usually narrow, glandular-lepidote. Flowers dicœcious, in spikes or racemes or the female solitary axillary or on the old wood. Male fl. globose. Calyx 3-partite; lobes valvate. Petals and disk O. Stamens numerous in a dense globose head of branched filaments; anther-cells divaricate; connective obscure. Pistillode O. Female fl.: Sepals 5-8, narrow, unequal, imbricate. Ovary 3-celled; cells each with a solitary ovule; styles 3, simple, connate at the base. Capsule small, of 3, smooth, 2-valved cocci. Seeds rounded on the back, bluntly angular on the inner face; testa crustaceous; albumen fleshy; cotyledons flat.

Leaves linear-oblong. Spikes long, slender	...	1. H. riparia.
Leaves obovate. Spikes short and stout ...	...	2. H. retusa.

1. H. riparia, Lour. Fl. Cochinch. 657; Fl. Br. I. 5, 455; Brandis For. Fl. 409; Bedd. Fl. Sylv. 212; Cooke Fl. Pres. Bomb. 2, 620; Trimen Fl. Ceyl. 4, 72; *Adelia neriifolia*, Roth. Nov. Sp. 375; Dalz. & Gibs. Bomb. Fl. 231; Grah. Cat. Bomb. Pl. 185. *Serni*, Vern. *Jarawaya*, Bhil. *Ran-Kanher*, M.

An erect, willow-like, evergreen shrub; branchlets pubescent. Leaves linear-lanceolate, numerous, crowded, 3″-6″ by ·25″-·5″, acute, apiculate at the apex, acute at the base, entire or more or less toothed, thinly coriaceous, dark-green glabrous above, pale and covered with small, orbicular scales beneath; lateral-nerves numerous, 10-30 pairs, distinct beneath; petioles very short; stipules linear, ·2″ long, fulvous-hairy. Flowers sessile, in axillary, bracteate spikes 2″-5″ long; bracts ovate-acute, pubescent, shorter than the buds. Male fl.: Sepals 3, concave, veined, glabrous. Stamens very numerous, in globose heads; anthers red. Female fl.: Sepals usually 5, very acute or acuminate, ·1″ long. Ovary densely pubescent; styles 3, connate at the base, about ·25″ long, papillose. Capsule small, globose, puberulous; seeds globose, yellow.

Sikkim Himalaya to Assam, Burmah, N. Bengal, Central Provinces, Western peninsula, Ceylon, Cochinchina, and Java; throughout the presidency usually along rocky river banks or in the beds of rivers and streams, very common in the Konkan and N. Kanara. Fl. Nov.-Apl. "Wood grey, moderately-hard and close-grained. Pores moderately-large, scanty. Medullary rays few, moderately-broad as well as numerous long, fine rays which appear like black cells on a thin section." Gamble.

2. H. retusa, Muell. Arg. in Linnæa 34, 200; Fl. Br. I. 5, 456; Brandis For. Fl. 455; Cooke Fl. Pres. Bomb. 2, 620; Bedd. Fl. Sylv. 212; *Adelia retusa,* Grah. Cat. Bomb. Pl. 185; Dalz. & Gibs. Bomb. Fl. 231. *Machim,* Vern.

A small rigid-branched glabrous shrub; branches very tough; branchlets obtusely angled, puberulous or glabrous. Leaves obovate, cuneate-obovate or oblanceolate, ·5″-2·5″ by ·25″-·6″, acute, obtuse or emarginate usually apiculate at the apex, acute at the base, more or less toothed particularly in the upper half, rigidly coriaceous, glabrous above, more or less covered with minute, orbicular glands beneath; lateral-nerves about 8 pairs looping within the margin, strong beneath; petioles very short. Flowers globose, sessile, in few or many-flowered spikes 1″-2″ long; female spikes often longer than the male; rachis glabrous; bracts small, ovate, acute, pubescent. Male fl. ovoid, pointed in bud. Sepals 3, ovate, concave, glabrous often apiculate. Stamens very numerous. Female fl.: Sepals narrow, lanceolate, acute, pubescent. Styles red, plumose. Capsule small, globose, hoary; seeds minute, yellow.

Central Provinces. Western peninsula from the Konkan to the Nilgiris; throughout the presidency in river beds often associated with *H. riparia.* Fl. Nov.-Apl.

29. SAPIUM, P. Br.

Trees or shrubs with abundance of acrid milky juice. Leaves alternate, entire or toothed with conspicuous, pinnate venation; petioles often biglandular

at the top. Flowers dicœcious or moncœcious, in terminal, simple or panicled spikes; male above, several in each bract; female in the lower part of the spikes or on separate spikes, solitary in the bracts. Petals and disk O. Male fl.: Calyx minute, membranous, 2-3-lobed or toothed or split to the base into 2-3 valvate segments. Stamens 2-3; filaments free; anther-cells ovoid, parallel. Pistillode O. Female fl.: Calyx trifid or tripartite. Ovary 2-3-celled; cells each with a solitary ovule; styles undivided, connate at the base, spreading and recurved. Capsule of 3, crustaceous cocci, fleshy or pulpy, rarely woody with a central, persistent columella. Seeds trigonous; testa crustaceous usually long persistent on the columella; albumen fleshy; cotyledons broad, flat.

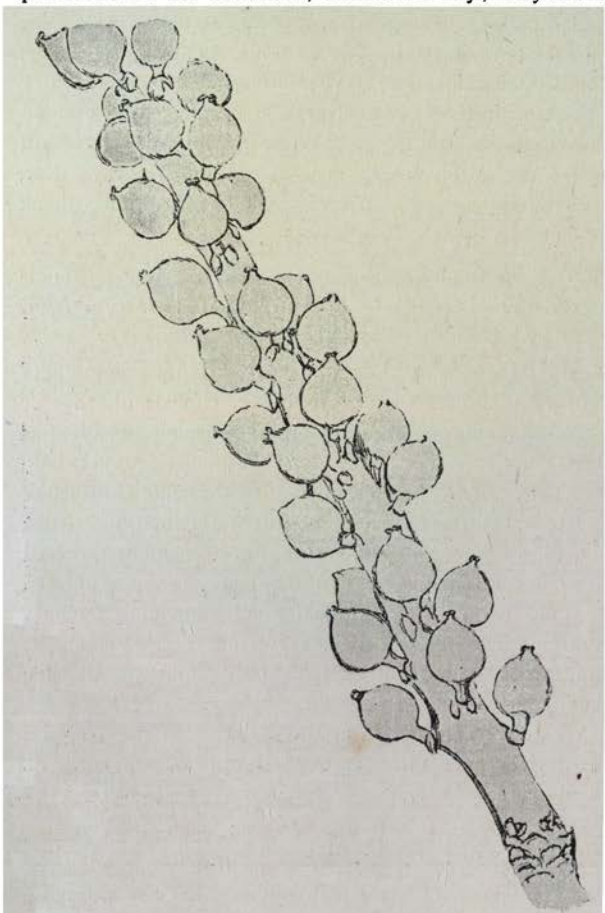

Fig 213. Sapium insigne, Benth.

1. S. insigne, Benth. Gen. Plant. 3, 335; Fl. Br. I. 5, 471, Var. *malabarica*; Trimen Syst. Cat. Ceyl. Pl. 83; Fl. Ceyl. 4, 76; Cooke Fl. Pres. Bomb. 2, 622; Gamble Ind. Timb. 625; *S. baccatum,* Grah. Cat. Bomb. Pl. 181 (not of Roxb.); *Falconeria malabarica,* Wight Ic. t. 1866; *Excœcaria insignis,* Muell. Arg. in DC. Prodr. 15, 1212; Bedd. Fl. Sylv. 214 & Anal. Gen. t. 22, fig. 5 (bis); Brandis For. Fl. 442. *Ure, hure, dudla,* M. *Kurda, nanaka,* K.

A small or large tree; branches thick, glabrous. Leaves oblong-lanceolate, crowded at the ends of the branches, 5″-12″ by 2″-3·5″, acuminate at the apex,

acute, sometimes unequal-sided at the base, crenate-serrate often with glandular margins ; lateral-nerves about 12 pairs arching upwards, slender; petioles 1″-2″ long with 2 large glands at the top. Flowers usually diœcious, green, appearing when the tree is bare of leaves in simple, terminal, erect, stout spikes 4″-8″ long; bracts several at base of spike, thick, linear-lanceolate; male sessile or very shortly pedicelled in circular groups of 10 flowers subtended by 2 thick, rounded, sessile glands; female solitary, spirally arranged along the spike which is thicker than that of the male, with 2, thick, separate or connate sessile, rounded glands at the base. Male fl. minute. Sepals 2, rounded, concave, membranous. Stamens 2; filaments short, divaricate; anthers 2-lobed, red; pollen yellow. Female fl.: Sepals ovate-obtuse. Ovary ovoid, glabrous; styles 2-3, connate at the base, short, thick, recurved. Capsule globose, ·8″ in diameter, 3-celled, fleshy at first and purple irregularly breaking up when ripe and dry; seeds ovoid, ·25″ long, smooth, pale.

Western peninsula from the Konkan southwards, common on laterite near the coasts of N. Kanara and the Konkan sometimes in monsoon-forest on the ghâts but always in dry rocky localities. Fl. C. S. Fr. Mch. Usually a small tree sometimes with a short, thick trunk, containing much acrid, milky juice. On account of its poisonous qualities this species and *Strychnos Nuxvomica* are the only trees found over large areas in the evergreen scrub along the N. Kanara coast. Bark corky, deeply fissured. Wood greyish, very soft and spongy; used for making the cylinders of native drums.

2. *S. sebiferum*, Roxb. Fl. Ind. 3, 693; Fl. Br. I. 5, 470; Dalz. & Gibs. Bomb. Fl. Suppl. 77; *Excœcaria sebifera*, Brandis For. Fl. 441. *Chinese Tallow Tree. Pipalyank*, Vern.

A small glabrous tree, native of China is occasionally cultivated in gardens near Bombay. The coriaceous capsules contain seeds covered with a thick coating of a white fatty substance *(vegetable tallow)* which is separated from the seeds by boiling in water. The tapers used in Chinese temples are made from it.

3. *S. indicum*, Willd. Sp. Pl. 4, 572; Fl. Br. I. 5, 471; Grah. Cat. Bomb. Pl. 181.

An evergreen glabrous tree about 30′ high with a glabrous, woody fruit about 1″ in diameter is sometimes planted but not indigenous within the limits of the Bombay presidency; it is mentioned in Graham's Catalogue of Bombay Plants as growing in various parts of the Konkan but has not been found wild by any subsequent observer. I have not described it in the present work.

30. EXCŒCARIA, LINN.

Trees or shrubs with acrid milky sap. Leaves simple, alternate or opposite, entire or subserrate. Flowers monœcious or dicœcious, minute, in terminal or axillary, unisexual or androgynous, bracteate spikes; male 1-3 in each bract, 2-bracteolate; female at the base of the raceme or on separate racemes; rachis with large glands beneath or at the sides of the bracts. Perianth simple. Male fl.: Calyx 2-3-divided. Disk O. Stamens 2-3, free or connate. Pistillode O. Female fl.: Calyx trifid or tripartite. Ovary 2-4-celled; cells each with a solitary ovule; styles 2-4, simple, connate at the base. Capsule tricoccous; cocci separating from the columella. Seeds globose or trigonous; albumen fleshy; cotyledons broad, flat.

Leaves alternate, elliptic	...	...	...	1. E. Agallocha.
Leaves opposite, linear-oblong	...	...	...	2. E. robusta.

1. E. Agallocha, Linn. Sp. Pl. 1451; Fl. Br. I. 5, 472; Brandis For. Fl. 442; Dalz. & Gibs. Bomb. Fl. 227; Bedd. Fl. Sylv. 255; Gamble Ind. Timb. 626; Cooke Fl. Pres. Bomb. 2, 624; Trimen Fl. Ceyl. 4, 77; *E. Camettia,* Willd. Sp. Pl. 4, 864; Grah. Cat. Bomb. Pl. 185. *The Blinding Tree. Geva, surind, phungali,* M. *Hara,* K.

A small evergreen, crooked and stunted, milky tree; branchlets stout, smooth, marked with the scars of fallen leaves. Leaves alternate, ovate, 2″-4″ by 1·25″-2″, shortly bluntly acuminate at the apex, rounded or subacute at the base, entire or more or less crenate-serrate, fleshy, glabrous shining; nervation reticulate, nerves at right angles to the midrib, very slender; petioles ·75″-1″ long, slender. Flowers minute, yellowish-green, fragrant; bracts rounded, fleshy; male in crowded catkin-like spikes usually crowded at the ends of the branches, 1·5″-2″ long; female-spikes fewer, more slender and shorter than the male. Male fl. sessile in the axils of rounded, acuminate bracts with several minute bracteoles. Sepals 3, small, subequal, subserrulate. Stamens with long filaments. Female fl. pedicellate, upper usually imperfect. Sepals ovate, subserrulate with a basal-gland within. Ovary trigonous; styles free nearly to the base. Capsule trigonous, ·25″-·5″ in diameter, smooth; seeds globose, smooth.

Tidal forests and marshes along the sea coasts of tropical Asia and Ceylon, Indian Archipelago and N. Australia; very common in the Konkan and N. Kanara. Fl. July-Aug. Fr. Sept.-Oct. The poisonous milky sap is very dangerous to wood cutters, causing blindness if it gets into the eyes hence the name *Blinding Tree* often given to this species; the generic name *Excœcaria* also refers to this fact. The sap hardens into a kind of black caouchouc. Bark grey, smooth, shining covered with prominent lenticels. Wood white or yellow, soft and spongy.

Pores small, scanty, usually in radial lines. Medullary rays fine, closely packed. Weighs about 28 lbs. to the cub. ft. A useful wood for general carpentry, toys, furniture etc.; converted into charcoal in the Sundarbans. Along the Western coast fishing-nets are usually supported by floats made from the roots.

2. E. robusta, Hook. f. in Fl. Br. I. 5, 474; Cooke Fl. Pres. Bomb. 2, 624. A shrub with slender, cylindrical, glabrous branches, opposite, linear-oblong, acuminate leaves and small, trigonous fruits. This species is very doubtfully indigenous in the Bombay presidency. There is only one sheet in the Kew herbarium from the presidency marked "Konkan" Stocks, but the handwriting on the ticket is not that of Dr. Stocks and the plant has not been seen hitherto by any other observer.

Order LXXXIII.—URTICACEÆ.

Herbs shrubs or trees often with milky or watery sap. Leaves simple, usually alternate; stipules various, often deciduous. Flowers small or minute, unisexual, monœcious, dicœcious, hermaphrodite or rarely polygamous, in heads or cymes sometimes on the surface of a fleshy disk or enclosed in a fleshy receptacle. Perianth simple, of 3-5 segments. Stamens as many as the perianth-segments and opposite to them or fewer; filaments erect or incurved in bud; anthers 2-celled. Pistillode of male small or O. Ovary free, 1-celled; ovule solitary; style simple or bifid with stigmatose arms or the stigma sessile, plumose or penicillate. Fruit indehiscent, a simple samara, drupe, small achenes or a fleshy syncarpium compounded of confluent perianths and pericarps. Seeds with or without albumen, erect or pendulous; embryo various.

A large order containing numerous species of economic and sylvicultural importance yielding valuable fibres, useful timbers, rubber and edible fruits.

Ovule pendulous from near the top of the ovary.

Trees with watery sap.

Stamens erect in bud or nearly so.

Fruit a dry winged samara ... ... 1. Holoptelea.

Fruit a drupe.

Stipules free.

Male sepals imbricate; cotyledons broad... 2. Celtis.

Male sepals induplicate-valvate; cotyledons narrow ... ... 3. Trema.

Stipules connate, convolute ... ... 4. Gironniera.

Trees or shrubs with milky sap.

Stamens inflexed in bud.

Male flowers subcapitate; female flowers solitary; style bifid ... ... 5. Streblus.

Male flowers in globose heads; female flowers confluent; style undivided ... ... 6. Plecospermum.

Stamens erect in bud or nearly so.

Male and female flowers on the inner wall of a closed receptacle ... ... 7. Ficus.

Male flowers on the outside of a globose or cylindrical receptacle ... ... 8. Artocarpus.

Male flowers on an open disk-like receptacle ... 9. Antiaris.

Ovary erect from or near the base of the ovary.

Fruiting perianth dry, membranous; style filiform ... 10. Bœhmeria.

Fruiting perianth fleshy; stigma sessile, penicillate 11. Debregeasia.

1. HOLOPTELEA, PLANCH.

Deciduous trees. Leaves simple, alternate, penninerved; stipules scarious, caducous. Flowers polygamous or bisexual, in lateral fascicles on last year's scaly, leafless shoots. Perianth simple, calycine, 4-8-lobed; lobes imbricate in bud. Stamens as many as the calyx-lobes; anthers pubescent. Ovary free, stipitate, compressed, 1-2-celled; ovules pendulous, anatropous, solitary in the cells; styles 2, papillose on the entire inner surface. Fruit a dry samara surrounded by a reticulate, obcordate wing; pedicels articulate; albumen O; cotyledons longitudinally complicate.

H. integrifolia, Planch. in Ann. Sc. Nat. ser. 3, 10, 266; Fl Br. I. 5, 481; Dalz. & Gibs. Bomb. Fl. 238; Cooke Fl. Pres. Bomb. 2, 629; Gamble Ind. Timb. 628; Trimen Fl. Ceyl. 4, 80; *Ulmus integrifolia,* Roxb. Cor. Pl. 1, 56, t. 78; Grah. Cat. Bomb. Pl. 188; Brandis For. Fl. 431; Bedd. Fl. Sylv. t. 310. *Indian Elm. Wowoli, vavli, papara,* M. *Tapsi,* K.

A large deciduous tree; branchlets pubescent. Leaves ovate, entire, young leaves sometimes serrate, 2″-5″ by 1″-2·5″, shortly acuminate at the apex, rounded or subcordate, sometimes unequal-sided at the base, chartaceous, glabrous; lateral-nerves about 6 pairs, distinct beneath; petioles ·25″-·5″ long, glabrous. Flowers greenish-yellow, about ·15″ across, polygamous, male and hermaphrodite flowers mixed usually in short racemes or fascicles supra-axillary on the naked branches. Sepals 4, pubescent, deciduous. Stamens 4-8; filaments glabrous; anthers pubescent. Ovary long-stipitate, compressed, 1-celled, pubescent; styles 2, grey, stigmatose, curved inwards. Samara nearly orbicular, about 1″ in diameter with thin, scarious, veined wings and with 2 hooks at the tip.

Outer ranges of the Himalaya, Ajmere, Bundelkhand, Behar, Burmah and the Western peninsula, throughout the presidency in monsoon sometimes in rain-forest, sometimes planted. Fl. Feb.-Mch. Fr. June-Aug. Bark grey, pustular, scaly with an offensive smell when freshly cut. Wood yellowish, close-grained, smooth and moderately hard, no heartwood. Pores small, uniformly distributed, enclosed in short, concentric, wavy bands or lines of white tissue. Medullary rays fine, white, equidistant, very distinct. Weighs 52 lbs. to the cub. ft. The wood is strong and suitable for building purposes, carts, etc., but is little used in this presidency.

2. CELTIS, LINN.

Trees or shrubs. Leaves small, alternate, entire or serrate, stipulate, triple-nerved; stipules lateral, free. Flowers small, polygamous, in axillary or lateral cymes, the male and hermaphrodite at the base of the shoots, the female cymes in the upper axils. Perianth simple, 4-5-lobed; lobes imbricate in bud, deciduous. Stamens 4-5, erect in bud, surrounding a woolly torus. Ovary sessile on a hairy disk; styles 2, simple or lobed. Fruit a small, ovoid or globose drupe with a hard endocarp; albumen O or scanty; embryo curved; cotyledons broad, inflexed, surrounding the upcurved radicle.

Leaves crenate or serrate, unequal-sided ... ... 1. C. cinnamomea.
Leaves nearly entire, equal-sided ... ... 2. C. Wightii.

C. cinnamomea, Lindl. in Wall. Cat. 3696; Fl. Br. I. 5, 482; Kurz. For. Fl. Br. Burm. 2, 472; Cooke Fl. Pres. Bomb. 2, 630; Trimen Fl. Ceyl. 4, 81; *C. tetrandra*, Talb. Trees Bomb. 322 (not of Roxb.); *C. Roxburghii*, Dalz. & Gibs. Bomb. Fl. 237 (not of Planch.); *C. dysodoxylon*, Thw. Enum. 267; Bedd, Fl. Sylv, 219. *Brumaj*, M.; *Hitari, heenari, henbig, hartal*, K.

A moderate-sized tree; branchlets tomentose. Leaves obliquely ovate, 3″-4″ by 1·25″-1·75,″ with a slender acumination at the apex, rounded or subacute at the base, entire, crenate or serrate, coriaceous, dark-green above somewhat paler beneath, trinervate with cross parallel veinules; petioles about ·25″ long; stipules small, linear, pubescent. Flowers appearing with the young leaves, articulate on the pedicels. Male in short, lateral, rusty pubescent, slender-branched cymes; female and hermaphrodite in more slender, axillary or terminal cymes; pedicels filiform of different lengths. Sepals usually 5, ovate oblong about ·1″ long, thin and densely ciliate. Stamens usually 5. Ovary ovoid, sessile on a woolly disk; styles ·2″ long, curled-villous. Drupe pisiform, obtusely beaked.

Outer Sikkim-Himalaya, Assam, Chittagong, Burmah, Behar, N. Bengal, Western peninsula, Ceylon and the Malay Archipelago; throughout the Konkan and N. Kanara usually in rain forest, locally common. Fl. June-Sept. Fr. Mch.-May.

Bark smooth, light-coloured, ·25″ thick, hard with black or brown irregular bands or layers of nearly bony tissue alternating with white or yellowish, soft tissue. Wood yellowish-grey, smooth shining, moderately hard. Annual-rings distinct. Pores small, often subdivided, enclosed in bands or lines of white tissue which are continuous in the spring-wood and in the rest of the ring wavy and often discontinuous. Medullary rays moderately broad on fine, short and white. Weighs 52 lbs. to the cub. ft. Used for building purposes in N. Kanara. Thwaite's name "*dysodoxylon*" does not apply to the freshly cut Kanara wood

which is without an offensive smell. Dr. Cooke has diagnosed my N. Kanara and Konkan specimens of the "*Brumaj*" tree to be unmistakably identical with *Celtis cinnamomea,* Lindl.

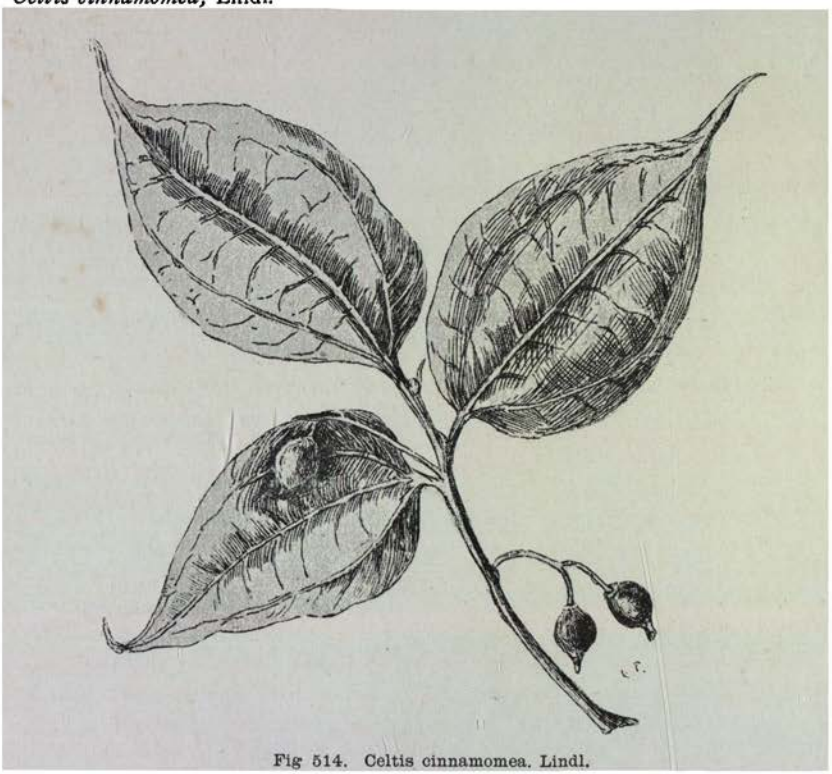

Fig 514. Celtis cinnamomea. Lindl.

2. C. Wightii, Planch. in Ann. Sc. Nat. ser. 3, 10, 307; Cooke Fl. Pres. Bomb. 2, 630.

A middle-sized tree with coriaceous, equal-sided, acuminate, crenate-serrate or entire leaves and a scarlet, ovoid, drupaceous fruit about ·5″ long is doubtfully indigenous within the limits of the Bombay presidency. I have seen no specimens from any Bombay locality; it is found in Ceylon, the Malay Archipelago and Southern India.

3. TREMA, Lour.

Evergreen trees or shrubs. Leaves alternate, 3-7 basal-nerved; stipules lateral, caducous. Flowers monœcious or polygamous, in small, axillary cymes,

3-bracteolate. Perianth simple. Male fl.: Sepals 4-5, induplicate-valvate or imbricate in bud. Stamens 5, longer than the sepals, erect in bud. Hermaphrodite or female fl.: Sepals of the male when stamens are present flat and subimbricate when stamens are absent. Ovary sessile; ovule pendulous; style-arms 2, linear. Fruit a small, ovoid drupe with a hard endocarp. Seed small; albumen fleshy; embryo curved or involute; cotyledons narrow; radicle incumbent.

T. orientalis, Blume Mus. Bot. 2, 62; Fl. Br. I. 5, 484; Gamble Ind. Timb. 630; Cooke Fl. Pres. Bomb. 2, 631; *Sponia orientalis*, Brandis For. Fl. 430; *S. Wightii*, Planch. in Ann. Sc. Nat. ser. 3, 10, 322; Dalz. & Gibs. Bomb. Fl. 238; Bedd. Fl. Sylv. t. 311. *The Indian Nettle* or *Charcoal Tree. Ranambada, kapashi, kargol,* M. *Benda-karke, gol,* Vern.

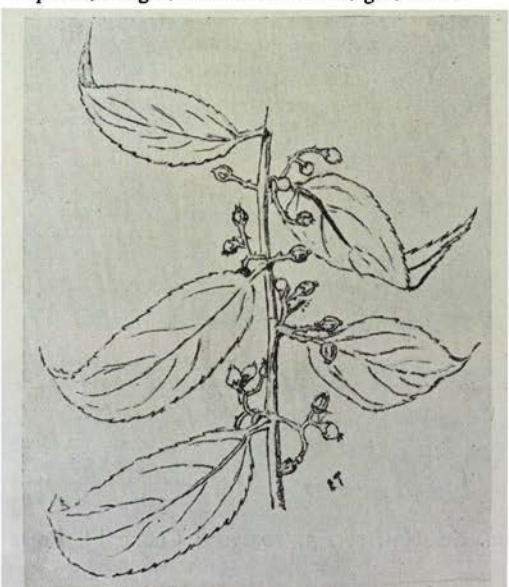

Fig 515. Trema orientalis, Blume.

A small short-lived tree of rapid growth; branchlets pubescent. Leaves obliquely ovate, 3″-5″ by 1·5″-2″, caudate-acuminate at the apex, cordate or rounded and unequal-sided at the base, obtusely serrate, softly tomentose beneath and more or less rough and scabrid above; lateral-nerves about 4 pairs arcuate and strong beneath, the lowest pair basal; petioles slender, ·25″ long, channelled, pubescent; stipules caducous. Flowers in small, spreading, pubescent cymes longer than the petioles. Male fl. globose, 3-bracteolate. Sepals elliptic-lanceolate, pubescent, ·1″ long. Stamens 5. Pistillode small. Female fl.: Sepals minute, ciliate. Ovary short, broad; style-arms villous, shortly incurved. Drupe ·15″ in diameter, black when ripe.

Base of the Nepal Himalaya, Bengal, Behar and southwards to Travancore and Singapore; throughout the Konkan and N. Kanara, common in rain and moist monsoon-forest, often planted as a shade-tree in the Wynaad and Mysore coffee plantations. Fl. Mch.-Jan. Fr. Dec.-Jan.

Bark smooth, grey, lenticellate. Wood reddish-grey, soft. Pores moderate-sized often subdivided. Medullary rays fine, numerous, uniform. Makes good gunpowder-charcoal. Growth very fast (1¼ rings per inch of radius).

4. GIRONNIERA, GAUD.

Evergreen trees or shrubs. Leaves alternate, penninerved; stipules sheathing, caducous. Flowers dicœcious, in axillary cymes or the female solitary. Male fl.: Sepals 5, broad, obtuse, imbricate. Stamens 5, erect. Pistillode woolly. Female fl.: Sepals narrower than in the male, acute. Ovary sessile; ovule pendulous; style central with 2 filiform arms. Drupe ovoid often keeled; endocarp hard; albumen copious, scanty or O; embryo contorted.

G. reticulata, Thw. Enum. 268; Fl. Br. I. 5, 486; Bedd. Fl. Sylv. t. 313; Cooke Fl. Pres. Bomb. 2, 631; Gamble Ind. Timb. 631; Trimen Fl. Ceyl. 44, 83. *Nyal*, K.

A large evergreen glabrous or nearly glabrous tree, buttressed at the base; branchlets obtusely angled and grooved. Leaves oblong to ovate-lanceolate, 3″-5″ by 1·5″-2·5″, acuminate or caudate at the apex, rounded or acute at the base, coriaceous shining; lateral-nerves 6-16 pairs, strong, clear and prominent beneath with reticulate venation between; petioles ·25″-·5″ long, sometimes sparingly appressed hairy; stipules linear, connate at the base, very early caducous, pubescent. Male fl. in slender, branched, axillary cymes as long as or longer than the petioles; bracts broad triangular, caducous, appressed hairy. Perianth-lobes rounded, concave, subimbricate. Stamens 5. Pistillode a very minute tuft of hairs. Female fl. solitary, axillary. Sepals narrower than in the male. Ovary glabrous. Drupe ovoid, beaked, ·75″ long including the grooved beak and persistent styles.

E. Bengal, Burmah, Sikkim, Assam, Ceylon, Java, Western peninsula from N. Kanara to Travancore; fairly abundant in the rain-forests of the Sircy and Siddapore talukas of N. Kanara particularly so near Hoolikul and Sonda where there are many fine and exceptionally large trees. Fl. Feb.-Mch. Fr. H. & R. S. Sometimes a very large tree 100′ high by 4′ in diameter and buttressed at the base. Bark grey, smooth, splitting into thin plates peeling from the base; inner-bark reddish with long, tough fibres intermixed with white bast. Wood dark-red or brownish, hard, smooth, compact and heavy, takes a fine polish. Pores medium-sized, numerous, simple or subdivided often filled with gum. Medullary rays very fine and numerous. A tough, strong timber. Judging from the large plank in the Poona Forest Museum the wood appears somewhat liable to small cracks whilst seasoning. The timber is however worth the attention of forest officers in N. Kanara.

5. STREBLUS, LOUR.

Unarmed trees or shrubs; juice milky. Leaves alternate, scabrid; stipules small, subulate. Flowers dicœcious, axillary; male in short, pedunculate clusters;

female solitary or 2-3 together, peduncled. Male fl.: Sepals 4, imbricate. Stamens 4, inflexed in bud. Pistillode dilated at the top. Female fl. bracteate. Sepals of the male. Ovary 1-celled; ovule pendulous; style central, arms very long. Fruit globose, enclosed in the perianth. Seed globose; testa membranous; albumen O.

S. asper, Lour. Fl. Cochin. 2, 615; Fl. Br. I. 5, 489; Bedd. Fl. Sylv. 221; Brandis For. Fl. 410; Cooke Fl. Pres. Bomb. 2, 642; Gamble Ind. Timb. 632; Trimen Fl. Ceyl. 4, 100. *Epicarpurus orientalis*, Blume; Dalz. & Gibs. Bomb. Fl. 240. *Punje*, *mittel-gidda*, *mitli*, K. *Poi*, *kharota*, *parayu*, M. *Karvati*, Vern.

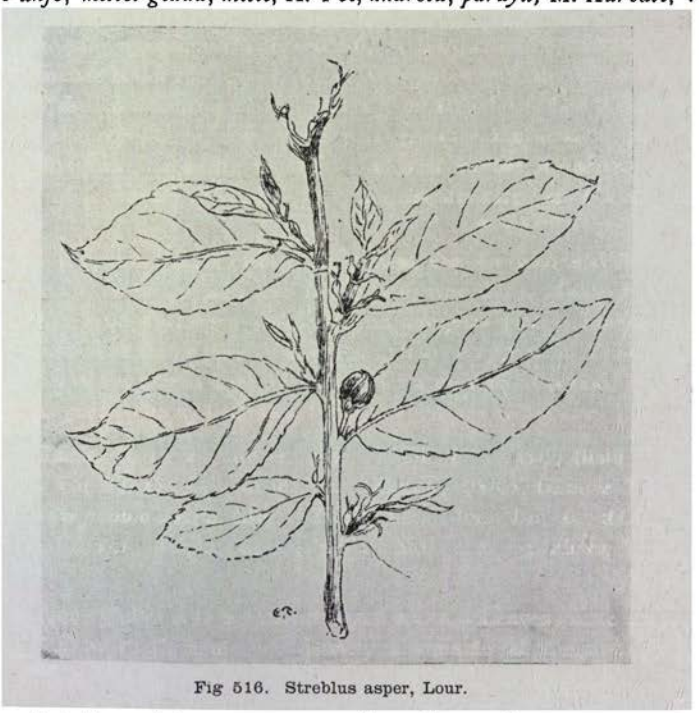

Fig 516. Streblus asper, Lour.

A small rigid gnarled evergreen tree; branchlets pubescent or tomentose. Leaves ovate, obovate or rhomboid, 1″-3″ by ·6″-1·25″, acute or acuminate at the apex, acute at the base, irregularly toothed in the upper half, scaberulous on both surfaces, particularly so below; lateral nerves 4-6 pairs; petioles short, ·15″ long; stipules obliquely lanceolate. Flowers dicœcious; male 2-3-bracteolate, in shortly peduncled, globose heads; female axillary, solitary or fascicled, 2-bracteolate, sometimes androgynous; pedicels ·5″ long. Male fl.: Perianth campanulate. Sepals 4, pubescent. Stamens 4. Female fl. on slender pedicels thickened at

the top. Perianth 6-fid; lobes closely imbricate. Ovary straight; styles 2, long-filiform, connate at the base. Fruit a yellow, edible, 1-seeded berry laxly enclosed in the enlarged, persistent perianth.

Sub-Himalayan tract from the Beas eastwards, Bengal, Central, Southern and Western peninsulas, Burmah, The Andamans and Ceylon; throughout the presidency common in dry open forests usually along river banks, in hedges and near villages also in rain-forest in N. Kanara. Fl. Jan.-Mch. Fr. Apl.-May.

A small tree somewhat resembling *Ficus asperrima* in appearance. Bark grey, soft, irregularly ribbed. Wood grey, moderately hard, tough and elastic, no heartwood, no annual-rings. Pores small or moderate-sized, subdivided, in concentric rings or bands of light-coloured, soft tissue. Medullary rays moderately broad, short and equally distributed. Weighs 48 lbs. to the cub. ft. Used for cart-wheels in Southern India. The bark is employed in paper making in Siam and the sap curdles milk like rennet, it is also used in native medicine. The leaves after they have been steeped in water serve like sandpaper for polishing wood, ivory and horn. The wood yields a useful firewood.

6. PLECOSPERMUM, Trecul.

Spinous or unarmed trees or shrubs. Leaves alternate, entire; stipules minute. Flowers dicœcious, in globose, axillary, peduncled heads. Male fl. bracteolate. Perianth 4-fid; lobes imbricate. Stamens 4, free, inflexed in bud. Female fl.: Perianth fleshy, gamophyllous, 4-toothed, connate into a fleshy head. Ovary free, 1-celled; ovule pendulous; style filiform, exserted. Fruit a globose, fleshy anthocarp enclosing a few globose, immersed,coriaceous seeds; albumen O; embryo subglobose; one cotyledon large, fleshy embracing the smaller folded one; radicle upcurved.

P. spinosum, Trecul in Ann. Sc. Nat. ser. 3, 8, 124; Fl. Br. I. 5, 491; Brandis For. Fl. 401; Bedd. Fl. Sylv. 220; Trimen Fl. Ceyl. 4, 103; Gamble Ind. Timb. 634; Cooke Fl. Pres. Bomb. 2, 642.

A large thorny shrub; branchlets drooping, pubescent; spines straight, axillary, 1″-2″ long. Leaves oblong or obovate, 2″-3″ by 1″-1·5″, obtuse, acute or very shortly acuminate at the apex, subacute at the base, hard, thinly coriaceous, glabrous; lateral-nerves about 6 pairs slender, parallel; petioles ·25″-·5″ long. Flowers in axillary, solitary or fascicled, peduncled heads; bracteoles minute; male-heads ·3″ in diameter; flowers free, minute; pedicels slender, ·25″ long; female-heads larger than the male, flowers connate. Male fl.: Sepals 5, obtuse, pubescent. Stamens 4 round a rudimentary ovary, inflexed in bud, long-exserted. Female fl.: Perianth 4-toothed, connate, the simple papillose styles exserted. Ovary included. Fruit a compound, irregularly shaped, 1-2-seeded, pubescent syncarpium about ·5″ in diameter.

Sub-Himalayan range from the Salt Range eastwards and southwards to Ceylon. Western peninsula; dry districts of the presidency often in hedges in parts of the Dharwar district also near Bunwasi in N. Kanara. Fl. Jany.-Apl. Fr. Apl-June.

Bark thin, orange-coloured, peeling off in thin flakes. Wood grey with a small, very hard, orange-yellow heartwood. A yellow dye is extracted from the wood in the Darjeeling district.

7. FICUS, LINN.

Trees or shrubs usually with milky juice and often epiphytic in early life. Leaves alternate or rarely opposite, entire or lobed; stipules amplexicaul, usually caducous. Flowers minute on the inner surface of an ovoid or globose, fleshy receptacle the mouth of which is closed by rows of imbricate bracts. Receptacles bracteate, unisexual, monœcious or dioœcious usually androgynous with the males which are rarely numerous near the mouth. Flowers of 4 kinds, male, female, gall-flowers and neuters. Male fl.: Perianth thin, 2-6-fid or partite. Stamens 1-2, erect in bud; anthers of 2, distinct cells. Neuter fl.: Perianth of the male. Female fl.: Perianth of the male or O. Ovary 1-celled; ovule pendulous; style excentric; stigmas various. Gall fl.: Perianth as in the female. Ovary and dilated style contain the pupa of Hymenopterous insects (*Blastophaga*). Fruit an enlarged, hollow, cup-shaped, closed receptacle the inner surface of which is studded with crustaceous or fleshy, minute achenes. Seed pendulous; albumen scanty; embryo curved; cotyledons equal or unequal; radicle upcurved.

Flowers pseudo-hermaphrodite. Male fl. monandrous with a pistillode and in the same receptacle as the gall fl. Female fl. in separate receptacles. (*Palæomorphe.*) ... ... 1. F. gibbosa.

Flowers unisexual, male, female and gall flowers in the same receptacle. Stamens 1 sometimes 2 in *F. callosa. (Urostigma.)*

Leaves coriaceous or subcoriaceous; petioles never jointed to the blade.

Receptacles sessile, 3-bracteate at the base.

Leaves more or less tomentose.

Receptacles red, pubescent, ·5″ in diameter ... ... 2. F. bengalensis.

Receptacles orange-yellow, pubescent, 1″ in diameter ... ... 3. F. mysorensis.

Receptacles grey-tomentose, ·3″ in diameter 4. F. tomentosa.

Leaves glabrous.

Receptacles yellow or reddish, ·3″ in diameter; petioles ·25″-·5″ long ... ... 5. F. retusa.

Receptacles yellow-green, dotted, ·25″ in diameter; petioles ·15″-1″ long ... 6. F. Talboti.

Receptacles in pairs, peduncled; basal-bracts O; peduncle with 3 small, bracts low down 7. F. nervosa.

Leaves subcoriaceous or membranous; petioles long, slender, often jointed to the blade. Receptacles in pairs sessile or in clusters, or solitary. Leaves more or less caudate-acuminate. Receptacles in sessile pairs or sometimes clustered in *F. Arnottiana.*

Receptacles when young white, dotted with dark spots, black when ripe ... ... 8. F. Rumphii.

Receptacles dark-purple ... ... 9. F. religiosa.

Receptacles from tubercles, purple-black with green dots ... ... 10. F. Arnottiana.

Leaves not caudate-acuminate.

Receptacles in clusters, small, whitish-yellow, dotted when ripe ... ... 11. F. Tsjakela.

Receptacles crowded at the ends of the branches, purple-black ... ... 12. F. Tsiela.

Receptacles in pairs, white, flushed with red and dotted .... 13. F. infectoria.

Receptacles peduncled, solitary, large, green, scabrid. Stamens usually 2 ... . 14. F. callosa.

Flowers unisexual; male and gall flowers in one set of receptacles, female in another; male flowers monandrous. (*Sycidium*).

Receptacles small, green, scabrid, dark-orange and nearly smooth when ripe ... ... 15. F. heterophylla.

Receptacles large, globose, 1″ in diameter, hispid, purple and yellowish-dotted when ripe ... 16. F. asperrima.

Flowers unisexual; male and gall flowers in the same receptacles. Female flowers in separate receptacles. Male flowers monandrous. *(Covellia).*

Receptacles peduncled, fascicled on the old wood or on leafy branches, yellowish, sometimes hypogeal. 17. F. hispida.

Flowers unisexual; male and gall flowers in one set of receptacles. Female flowers in a distinct set, smaller than the male. Male flowers diandrous. *(Neomorphe).*
Receptacles large, red, on short axillary, scaly and leafless branches ... ... 18. F. glomerata.

1. F. gibbosa, Blume Bijdr. 466; Fl. Br. I. 5, 496; Var. *parasitica,* King Sp. Fic. 6, t. 26. Fig. 8; Cooke Fl. Pres. Bomb. 2, 644; Gamble Ind. Timb. 637; *F. tuberculata,* Bedd. Fl. Sylv. 224; *F. parasitica,* Kœn; Bedd. Fl. Sylv. 224; Brandis For. Fl. 420; *Urostigma Ampelos,* Dalz. & Gibs. Bomb. Fl. 315; *U. volubile,* Dalz. & Gibs. Bomb. Fl. 240; *Datir,* Vern. *Umbar,* Guz.

Fig 517. Ficus gibbosa, Blume

An epiphytic shrub or sometimes a tree often enclosing the host tree in a net-work of branches. Leaves oblong, ovate-lanceolate, more or less rhomboid, 3″-6″ by 1·5″-3″, obtuse, acute or subcaudate at the apex, acute and often unequal-sided at the base, hispid above, minutely hispid beneath; lateral-nerves 3-7 pairs prominent beneath, basal pair strongest; petioles ·25″-·5″ long; stipules ovate-lanceolate, ·25″-·5″ long, slightly curved. Receptacles pyriform, peduncled, ·25″-·3″ in diameter, solitary or in pairs, axillary, minutely verrucose, yellow when ripe and without basal-bracts; peduncles ·1″-·5″ long, bracteate near the base. Male fl. near the mouth of the gall-flower receptacles. Sepals linear, fleshy, hairy. Stamen 1; filament short, united by its base to an abortive (insect attacked) pistil. Gall fl.: Perianth of the male. Ovary globose, smooth; style short, lateral. Fertile fl. in separate receptacles. Sepals 4, slightly hairy. Style elongate, lateral. Achenes obliquely ovoid, papillose.

Tropical India from Kumaon to Burmah and southwards to the Malay peninsula and Ceylon, Andamans, Western peninsula; throughout the presidency

in dry and moist forests often on old walls or on the sides of old wells; a common epiphyte. Fr. Apl.-May.

Bark thin, smooth, greenish-yellow. Wood dark or light-brown, moderately hard, divided into alternate, broad, hard, dark and narrow, light, soft, wavy rings. Pores moderate-sized to large, scanty, irregularly distributed. Medullary rays indistinct. Weighs about 42 lbs. to the cub. ft. The leaves are sometimes used as a substitute for sand paper for polishing ivory or wood.

2. F. bengalensis, Linn. Hort. Cliff. 471; Fl. Br. I. 5, 499; Bedd. Fl. Sylv. 222; Brandis For. Fl. 412; King Sp. Fic. 18 t. 13 & t. 81, Fig. C; Cooke Fl. Pres. Bomb. 2, 645; Gamble Ind. Timb. 638; *F. indica,* Linn. Amœn. Acad. ed. 3, 1, 27; Grah. Cat. Bomb. Pl. 189; *Urostigma bengalense,* Gasp. Nov. Gen. Fic. 7; Dalz. & Gibs. Bomb. Fl. 240. *Banyan Tree. Wad, alada, vadi,* Vern. *Al.* K. *Wur, bur.* Sind.

A large evergreen tree with spreading, long, stout branches sending down to the ground many aerial roots which afterwards develop into separate trunks; young shoots etc. softly pubescent. Leaves ovate, 4″-8″ by 2″-5″, usually obtuse at the apex, cordate or rounded at the base, coriaceous, glabrous shining above, minutely pubescent beneath; basal-nerves 3-5 with 4-6 pairs of lateral-nerves above; petioles 1″-2″ long; stipules coriaceous, ·75″ long. Receptacles globose, ·5″-·75″ in diameter, in pairs, sessile, red when ripe, puberulous; basal-bracts rounded, coriaceous, nearly glabrous. Male fl. near the mouth of the receptacles, monandrous. Sepals 4, lanceolate. Gall fl.: Sepals of male. Style short. Female fl.: Perianth shorter and style longer than in the gall flowers.

Sub-Himalayan forests and on the lower slopes of the hill ranges of Southern India; planted throughout the plains of India usually in avenues and as a roadside tree, self-sown in the monsoon and rain-forests of the Western ghàts. Trees with a very large spread of crown are found in the N. Kanara and Southern Mahratta districts; well known and exceptionally large trees exist in the Poona and Satara Deccan districts. Fr. ripe Apl.-June.

An evergreen tree sometimes with a spread of crown up to 2000 sq. ft. and thick aerial roots which however do not develop properly on the hard laterite soil near the sea coast. Other species of *Ficus* appear to be similarly affected under similar conditions of growth. Bark smooth, grey, exfoliating in small, irregular plates. Wood grey, moderately hard. Pores scanty, large, simple or subdivided. Medullary rays fine, equidistant, crossed by wavy lines of light-coloured tissue. Weighs about 42 lbs. to the cub. ft. The wood is durable under water and is made into well-curbs; when properly cut and seasoned is used for boxes and common furniture. The bark yields a coarse fibre and the milky juice strong birdlime. The large drop-roots furnish excellent light poles for palanquins, muncheels, cart-yokes and tent-poles. The bark and leaves are employed in native medicine.

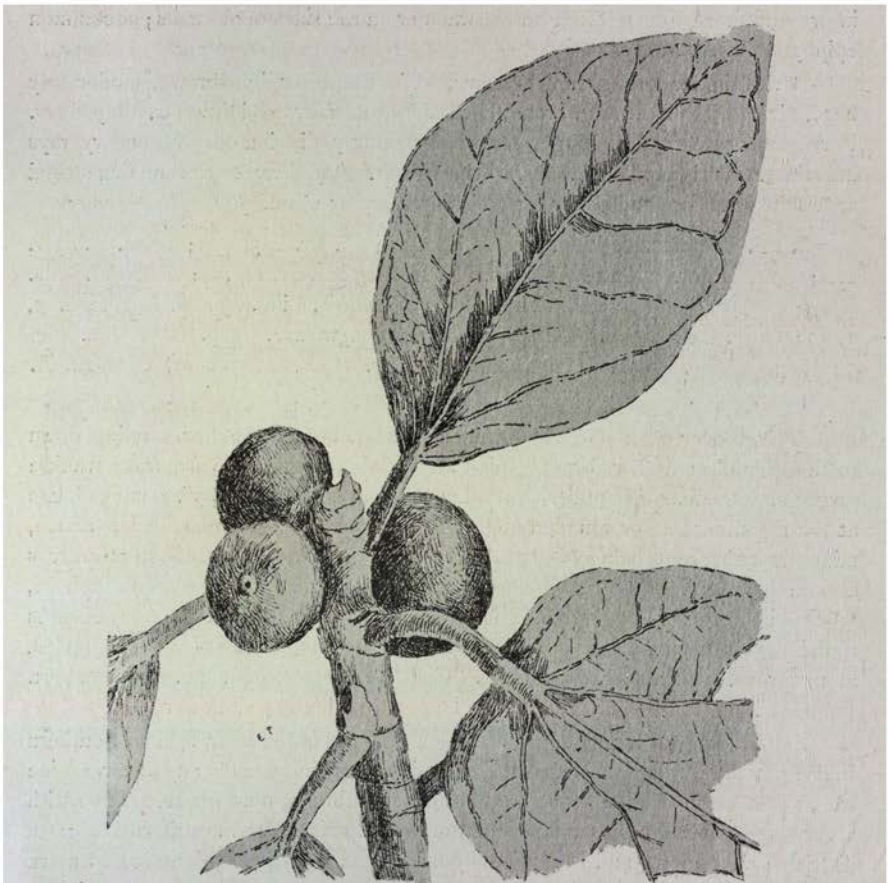

Fig 518. Ficus bengalensis, Linn.

The *Banyan* is considered sacred by the Hindoos. There is however no religious prejudice against felling this tree in N. Kanara or Belgaum during the exploitation of the fuel reserves. Considerable difficulty is found in eradicating the *Banyan* and several other species of *Ficus*, owing to the great vitality of their root systems.

3. F. mysorensis, Heyne in Roth. Nov. Sp. 390; Fl. Br. I. 5, 500; Brandis For. Fl. 414; King Sp. Ficus 19, t. 14 & t. 81, Fig. D; Bedd. Fl. Sylv. 222; Cooke Fl. Pres. Bomb. 2, 645; Gamble Ind. Timb. 638; Var. *pubescens,* King, Sp. Fic. 20; *Urostigma dasycarpum,* Miq. in Hook. Lond. Jour. Bot. 6, 574; Dalz. & Gibs. Bomb. Fl. 242; *Burali-wad,* Vern. *Bhurvar,* M. *Changal, gol.* K.

A large tree with a short stem and spreading, shady crown; sometimes when in ripe fruit loses all its leaves within a short period; aerial roots few embracing the trunk; branchlets grey, flocculent-tomentose, ultimately glabrous. Leaves ovate or elliptic, 3·5″-8″, by 2·5″-5″, shortly acuminate at the apex, cordate or rounded at the base, entire, coriaceous, at first flocculent-tomentose, afterwards glabrous; lateral-nerves about 12 pairs spreading and arching, strong and prominent beneath, basal-pair faint; petioles 1″-1·5″ long; stipules broad, triangular. Receptacles oblong or obovate, about 1″ long, sessile, binate, truncate or flattened at the top, flocculent when young, bright yellow or orange-red when ripe, supported by 3, obtusely triangular, spreading bracts. Male fl. pedicelled near the apex of the receptacle. Sepals 4. Stamen 1; anther didymous. Achene of gall-flower broad, smooth; style short. Fertile fl.: Sepals 4. Style elongate, lateral. Achenes ovoid.

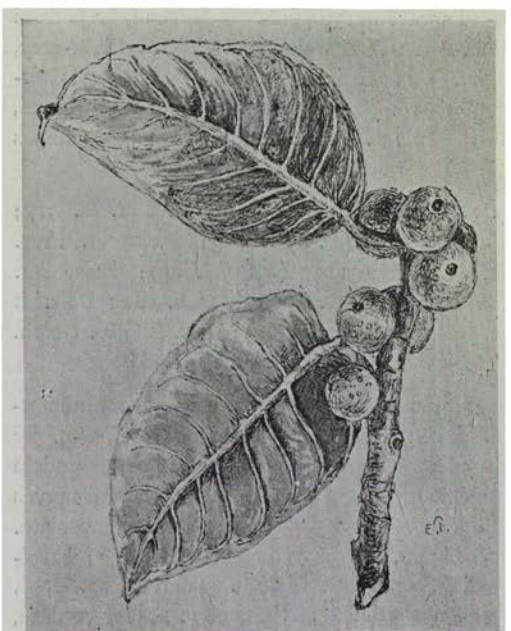

Fig 519. Ficus mysorensis, Heyne.

India, base of the Himalaya from Sikkim eastwards, Burmah, Western peninsula and Ceylon; throughout the Konkan and N. Kanara in monsoon and rain-forest also near villages and in open situations, self-sown, often planted as a roadside tree in N. Kanara. Fr. ripe Apl.-May. Bark ·5″ thick, grey, rough with short, horizontal lines of raised lenticels. Green parenchyma close to the surface; inner-bark, hard, yellowish, woody, with milky juice. Wood light-grey, smooth. Pores moderate-sized, subdivided, scanty, mostly contained in narrow, wavy bands of white tissue. Medullary rays moderately broad to fine, somewhat sinuous. Weighs about 40 lbs. to the cub. ft. Var. *pubescens,* with smaller leaves more copious and denser rusty tomentum is found in monsoon-forest near Mundgode in the N. Kanara district.

4. F. tomentosa, Roxb. Fl. Ind. 3, 550; Fl. Br. I. 5, 501; Brandis For. Fl. 414; Bedd. Fl. Sylv. 223; King Sp. Fic. 22, t. 18 & t. 81, Fig. G; Cooke Fl. Pres. Bomb. 2, 646; *Donkey's Banyan. Kulgolu, kulatti, kullugol,* K.

A large or moderate-sized tree usually epiphytic with aerial roots from the branches; young parts rusty-grey tomentose. Leaves crowded towards the ends of the branches, ovate or ovate-oblong, 1·2″-5″ by 1″-3″, obtusely apiculate at the apex, rounded or subcordate at the base, entire, coriaceous, glabrous above, softly grey-tomentose beneath with 4-5 pairs of lateral-nerves strong beneath; petioles ·75″-1″ long; stipules ·5″ long, woolly. Receptacles axillary, sessile, binate, globose, ·25″-·4″ in diameter, tomentose; basal-bracts 3, large, spreading. Male fl.: Sepals 4, lanceolate. Stamen 1. Gall fl.: Sepals 4 shorter than the ovary. Ovary smooth; style short. Fertile fl.: Sepals of the gall-flower. Style elongate. Achenes tubercled.

Drier parts of the Gangetic plain, Behar, Central India, Western peninsula and Ceylon; throughout the presidency, common near the sea-coasts of the Konkan and, on the rocky Kanara coast quite near the sea where the roots and branches are often wetted with the salt spray, on the sand-stone rocks near Badami in the Bijapore district. Fr. ripe Mch.-Apl. Bark white, scaly. Wood light-grey, soft. Pores large, subdivided, scanty. Concentric bands of soft white tissue alternate with darker bands of coloured tissue. Medullary rays moderately broad, white, distinct. Weighs 26 lbs. to the cub. ft. The leaves and young branches serve as fodder near Badami in the Bijapore district.

5. F. retusa, Linn. Mantiss. 129; Fl. Br. I. 5, 511; Brandis For. Fl. 417; King Sp. Fic. 50, t. 61 & t. 64, Fig. P.; Bedd. Fl. Sylv. 223; Cooke Fl. Pres. Bomb. 2, 647; *F. Benjamina,* Willd. Sp. Pl. 4, 1143 (not of Linn.); Grah. Cat. Bomb. Pl. 191; *Urostigma nitidum,* Miq. in Hook. Lond. Jour, 6, 582; Dalz. & Gibs. Bomb. Fl. 242; *U. retusum,* Gasp. Nov. Gen. Fic. 7; Dalz. & Gibs. Bomb. Fl. 241. *Nandruk, pilala,* Vern. *Pili-mara, pilal,* K.; *Pinwal,* Hind.

A moderate-sized glabrous evergreen tree; aerial roots usually very numerous, like whip-cord, rarely absent. Leaves elliptic, ovate or obovate, 2″-5″ by 1·5″-3″, obtuse or very obtusely cuspidate at the apex, narrowed into the petiole at the base, coriaceous, glabrous shining above, paler beneath; lateral-nerves numerous, slender, basal pair distinct; petioles ·25-·5″ long; stipules lanceolate. Receptacles small, sessile, axillary, binate, red or yellowish when ripe; basal-bracts 3, broad-ovate, obtuse, spreading, persistent. Male fl. numerous, scattered, sessile, shortly pedicelled. Sepals 3, subspathulate. Stamen 1; anther cordate, apiculate. Gall fl. sessile or pedicelled. Sepals 3, lanceolate. Ovary ovoid, narrowed at each end; style terminal. Fertile fl.: Perianth as in the gall flowers. Style short, lateral. Achenes ovoid or obovoid, minutely tubercled.

Eastern Himalaya from Kumaon to Bengal. Assam, Southern India, Western peninsula, Burmah and the Andamans, Ceylon; throughout the presidency, commonly planted along roadsides. Usually a short-stemmed tree with a large spreading crown affording dense shade. Bark smooth, dark-coloured. Wood

light, reddish-grey, close-grained; moderately hard to soft, mottled. Pores small or moderate-sized, scanty. Medullary rays moderately broad, crossed by narrow bands of soft, reddish tissue. Weighs 35 lbs. to the cub. ft. Only used for fuel.

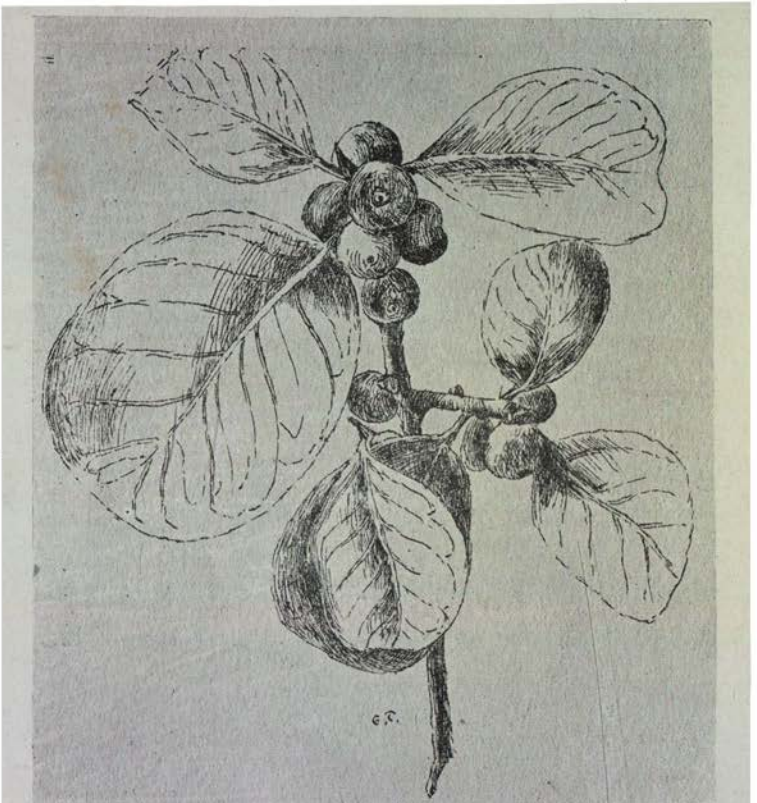

Fig 520. Ficus retusa, Linn.

6. F. Talboti, King. Sp. Fic. 51, t. 63 & t. 64, Fig. Q; Fl. Br. I. 5, 512; Cooke Fl. Pres. Bomb. 2, 647, *Atti-mara*, K.

A large, glabrous tree with abundant white milky juice, that of the shoots yellowish; aerial roots few or absent. Leaves ovate or elliptic, 3·5″-4″ by 2·5″-2″, shortly caudate-acuminate at the apex, rounded, subacute or narrowed into the petiole at the base, thinly coriaceous, smooth shining above, paler beneath; lateral-nerves about 10 pairs, slender, usually distinct; petioles ·75″-1″ long; stipules pubescent, ovate, ·25″ long. Receptacles sessile, binate, obovoid, depressed at the apex, yellowish-green, dotted when ripe; basal-bracts 3, ovate-acute. Male fl. few,

sessile, near the mouth of the receptacle. Sepals 3, broadly ovate. Stamen 1; filament short. Gall fl. sessile or pedicelled. Sepals 3, lanceolate. Ovary ovoid, narrowed at each end; style terminal. Fertile fl.: Perianth of the gall flower. Style short, lateral. Achenes ovoid or obovoid, minutely tubercled.

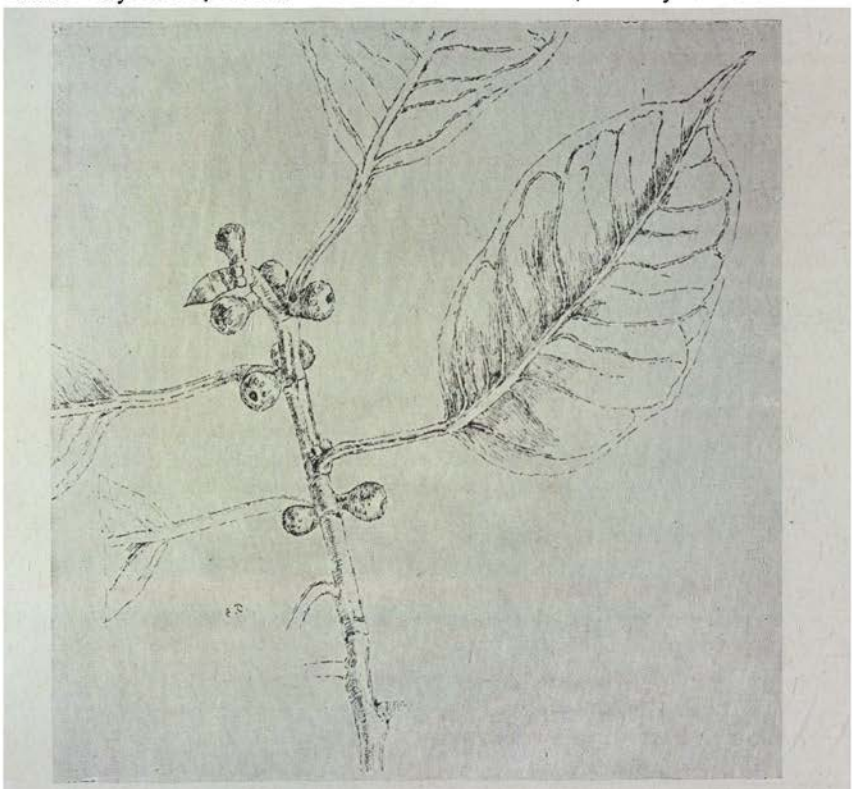

Fig 521. Ficus Talboti, King.

Western peninsula; throughout the moist monsoon and rain-forests of the Belgaum and N. Kanara ghàts. Fr. ripe C. S. A large or moderate-sized tree epiphytic in early life with very few or no aerial roots. Bark grey, smooth; green parenchyma developed. Would make an excellent, shady, avenue-tree.

7. F. nervosa, Heyne in Roth, Nov. Pl. Sp. 388; Fl. Br. I. 5, 512; Bedd. Fl. Sylv. 223; Cooke Fl. Pres. Bomb. 2, 647; King Sp. Fic. 53, t. 65.

A very large evergreen tree without aerial roots, with a straight, cylindrical trunk and abundance of white pearly juice; shoots tomentose. Leaves ovate or elliptic-oblong, 3″-5·5″ by 1·5″-3″, shortly abruptly acuminate at the apex, usually

acute or rounded at the base, coriaceous, glabrous shining on both surfaces; lateral-nerves 6-12 pairs looping within the margin usually very strong beneath, with conspicuous, slender, reticulate venation between; petioles channelled, ·5″-1·5″ long; stipules ovate-lanceolate, thin, ·5″ long. Receptacles axillary, globose, binate, peduncled, ·5″-·75″ in diameter with thick, hard walls, puberulous when young, yellow when ripe; peduncles ·5″ long, slender, pubescent; bracts at the base of receptacles O but with 3 small, ovate, rounded, pubescent bracts at the base of the peduncle. Male fl. pedicelled, few near the mouth of the receptacle. Sepals 2, unequal, spathulate. Stamen 1 adnate to a sepal. Gall fl. sessile or pedicellate. Sepals 3, elongate, acuminate. Ovary ovoid, smooth; style short. Fertile fl. usually sessile. Sepals 3, acuminate; style twice as long as the achene; stigma clavate.

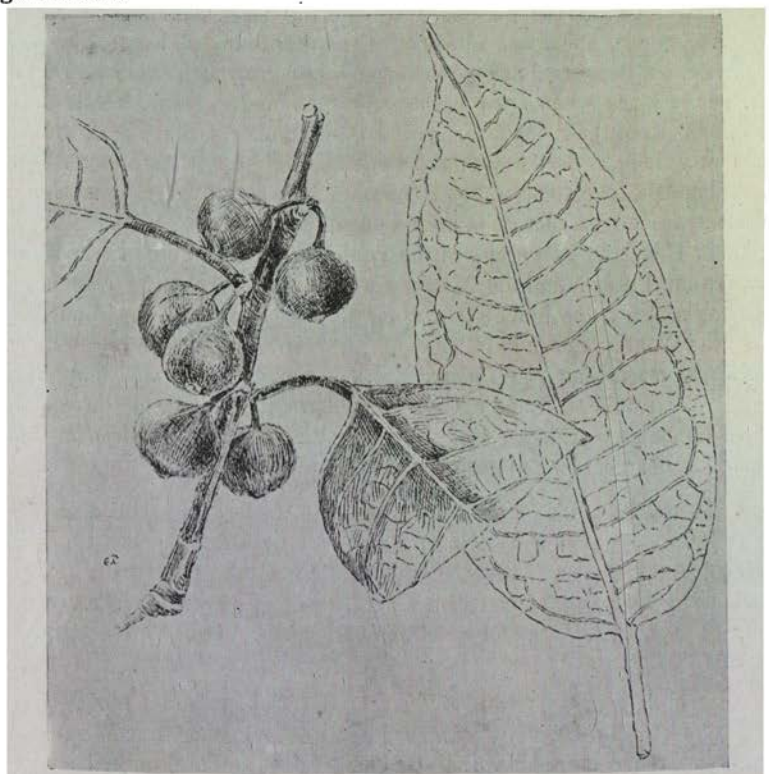

Fig 522. Ficus nervosa, Roth.

Sikkim and Bhotan Himalaya, Assam, Burmah, Western peninsula, Ceylon, Malay peninsula and Archipelago, China; rain-forests of N. Kanara from

Supa southwards also near Bhimashunkar on the Poona ghâts. Fr. ripe C. S. Bark smooth, dark-coloured. Wood unknown said to be very soft and useless.

8. F. Rumphii, Blume Bijdr. 437; Fl. Br. I. 5, 512; King Sp. Fic. 54, t. 67 B & t. 84, Fig. T; Gamble Ind. Timb. 644; Cooke Fl. Pres. Bomb. 2, 648; *F. cordifolia,* Roxb. Fl. Ind. 3, 548 (not of Blume); Brandis For. Fl. 416; Wight Ic. t. 640; *Urostigma cordifolium,* Miq. in Hook. Lond. Jour. Bot. 6, 564; Dalz. & Gibs. Bomb. Fl. 242. *Pair, ashta,* M.

A moderate-sized deciduous, glabrous tree, epiphytic in early life. Leaves broadly ovate, 3″-6″ by 2″-4″ caudate-acuminate at the apex, broad and slightly narrowed towards the petiole or subcordate at the base, subcoriaceous, shining and minutely tubercled above; margins entire, subundulate; lateral-nerves 8-10 pairs, lowest 2 pairs basal; petioles 4″-6″ long; stipules ovate-lanceolate, ·5″-1″ long. Receptacles axillary, sessile or very shortly peduncled, binate, globose, ·5″ in diameter, not depressed at the apex, smooth, when young whitish with dark spots, nearly black when ripe; basal-bracts 3, rounded, small. Male fl. only near the mouth of the receptacle. Sepals 3, spathulate. Stamen 1; anther on a filament as long as itself. Gall and Fertile fl.: Sepals 3, lanceolate. Ovary of gall flower obovoid, smooth. Achenes minutely tubercled, mucilaginous; style elongate; stigma clavate in both kinds of flower.

Outer Himalaya, Mountains of the Punjab, Northern, Central and Western India, Assam, Burmah and the Malay peninsula; Western ghâts near Bombay at Khandala also in the Mahableshwar forests on laterite, on the Ahmednagar ghâts near Waki, not seen in N. Kanara. Fr. ripe May-June. A moderate-sized tree closely resembling *F. religiosa.* Bark yellowish-grey, exfoliating in hard scales. Wood white, soft and spongy with alternating bands of soft and hard tissue. Pores large scanty. Medullary rays fine, equidistant. Used in Cachar for marking charcoal employed in the manufacture of tea. The fruit is edible.

9. F. religiosa, Linn. Hort. Cliff, 471; Fl. Br. I. 5, 513; Bedd. Fl. Sylv. t. 314; Brandis For. Fl. 415; King Sp. Fic. 55, t. 67 A & t. 84, Fig. U; Gamble Ind. Timb. 644; Cooke Fl. Pres. Bomb. 2, 649; Grah. Cat. Bomb. Pl. 190; *Urostigma religiosum,* Gasp. Ricer. Caprif. 82, t. 7, Fig. 1-5; Dalz. & Gibs. Bomb. Fl. 241. *The Pipal Tree. Arli, busri, pipal,* Vern. *Jari, pipro,* Guz. *Ashvatha,* M.

A large glabrous usually epiphytic tree but without aerial roots. Leaves ovate-rotund, 4·5″-7″ by 3″-4·5″ narrowed upwards and caudate-acuminate at the apex, broad, rounded or subtruncate (in young leaves cordate) at the base, coriaceous, shining but not tubercled above, paler and minutely tubercled when dry beneath; margins entire, undulate; lateral-nerves 8-10 pairs, lowest 2 pairs basal; petioles 3″-5″ long; stipules minute, ovate-acute. Receptacles depressed-

globose, ·25″ in diameter, sessile, binate, smooth, dark-purple when ripe; basal-bracts broad, spreading. Male fl. sessile, scanty at the mouth of some of the receptacles absent in others. Sepals 3, broadly ovate. Stamen 1, sessile, or pedicelled. Gall and Fertile fl. sessile or pedicelled. Sepals 5, lanceolate. Style short, lateral; stigma rounded.

Fig 523. Ficus religiosa, Linn.

Wild in the Sub-Himalayan forests, Bengal and Central India. Planted near temples and villages throughout the presidency. Fr. ripe May-July. Bark grey. Wood light-brown with yellowish patches and numerous, narrow bands of soft tissue alternating with broader bands of firmer tissue, moderately hard. Pores moderate-sized and large, rather scanty. Medullary rays uniform and equidistant, moderately

broad. Weighs about 35 lbs. to the cub. ft. The *Pipal* is regarded as one of the most sacred trees in the Hindoo and Buddhists religions; it causes great damage to the walls of old temples and wells, is not easy to extirpate and is also destructive to forest trees in Northern India where it is difficult owing to religious prejudice to get it cut. The leaves, bark and fruit are used in native medicine and the milky juice yields a kind of inferior rubber. Wood sometimes used for fuel and rough packing-cases.

10. F. Arnottiana, Miq. Ann. Mus. Lugd. Bat. 3, 287; Fl. Br. I. 5, 513; King Sp. Fic. 56, t. 68 & t. 84, Fig. V; Cooke Fl. Pres. Bomb. 2, 649; *F. cordifolia,* Graham Cat. Bomb. Pl. 192 (not of Roxb.); *Urostigma cordifolium,* Dalz. & Gibs. Bomb. Fl. 242. *Pair,* Vern.

Fig 524. Ficus Arnottiana, Miq.

A glabrous tree or shrub without aerial roots; branchlets stout, wrinkled. Leaves broadly ovate or elliptic, 3″-8″ by 2″-6″, narrowed upwards, shortly caudate-acuminate at the apex, usually shallowly cordate or obtuse at the base, subcoriaceous; lateral-nerves 11-15 pairs, slender, parallel, lowest 2 pairs basal; petioles 2″-6″ long; stipules ovate-lanceolate, ·5″-1″ long, caducous. Receptacles depressed-globose, ·25″-·4″ in diameter, sessile or shortly peduncled, binate or in clusters from axillary tubercles, smooth, purple-black with greenish dots when ripe; basal-bracts 3, brown, membranous. Male fl. few, sessile near the mouth of the receptacle. Sepals 3, loose, inflated, broad-acuminate. Stamen 1; anther small, subsessile. Gall and fertile fl. sessile or pedicellate, similar. Perianth lax, toothed, embracing the ovary. Style elongate; stigma flat.

Rajputana, Central Provinces, Behar, Western peninsula and Ceylon; throughout the Konkan and N. Kanara in rocky places near the coast or inland in monsoon or rain-forest, nowhere common. Fr. ripe Feb.-Apl.

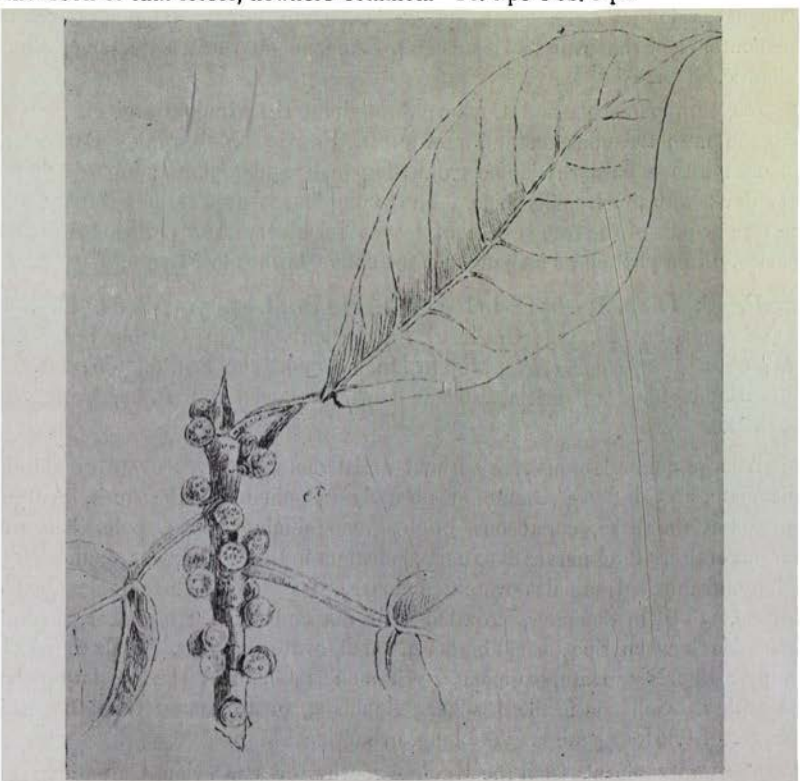

Fig 525. Ficus Tsjakela, Burm.

11. F. Tsjakela, Burm. Fl. Ind. 227; Fl. Br. I. 5, 514; King Sp. Fic. 57, t. 70 & t. 84, Fig. X; Cooke Fl. Pres. Bomb, 2, 650; Tsjakela, Rheede Hort. Mal. 3, t. 64. *Kel*, M.

A large deciduous glabrous tree without aerial roots; branchlets stout, rough. Leaves ovate-oblong, 3″-7″ by 1·5″-3′, shortly, often abruptly acuminate at the apex, rounded or subacute at the base, thinly coriaceous, bright green shining above; margins slightly undulate; lateral-nerves 10-12 pairs distinct on both surfaces, lowest 2 pairs basal; petioles 1·5″-2″ long; stipules small, ovate-lanceolate; bud-scales very numerous, linear-lanceolate, 3″-5″ long, thin, scarious, red, caducous. Receptacles usually sessile, in clusters of 2-6, on short, crowded, axillary tubercles or on the branches below the leaves, depressed-globose, about ·2″ in diameter, whitish-yellow, dotted when ripe; basal-bracts 3, broad, bifid. Male fl. scanty near the mouth of the receptacle, sessile. Sepals 3, ovate-acuminate. Stamen 1; filament as long as the ovate anther. Gall and Fertile fl. alike excepting the contents of the ovary. Sepals 3-4. Achene obovate; style long; stigma cylindric.

Western peninsula and Ceylon; throughout the Konkan and N. Kanara, common in moist monsoon and rain-forest. Fr. ripe Mch.-May. Bark dark-coloured with a hard rhytidome exfoliating in irregular plates; inner-bark red, very thick, with much milky juice. The young leaves appear in February after the tree or part of the tree is bare of leaves for a very short period. A distinct species, often planted as a shade tree for coffee bushes in Mysore.

12. F. Tsiela, Roxb. Fl. Ind. 3, 549; Fl. Br. I. 5, 515; Bedd. Fl. Sylv. 314; Brandis For. Fl. 415; Cooke Fl. Pres. Bomb. 2, 650; Gamble Ind. Timb. 645; *Urostigma pseudo-Tjiela*, Miq. in Hook. Lond. Jour. Bot. 6. 566; Dalz. & Gibs. Bomb. Fl. 241; Tsiela, Rheede Hort. Mal. 3, t. 63. *Pipri,* Vern. *Bili-basri*, K.

A large quite glabrous tree without aerial roots. Leaves ovate or elliptic-lanceolate, 2″-5″ by 1″-3″, acute or obtusely acuminate at the apex, acute or rounded at the base, coriaceous, bright-green shining above, paler beneath; margins entire, lateral-nerves 8-10 pairs, indistinct in the fresh leaves; petioles 1·5″-2″ long, channelled; stipules ovate-acuminate, ·5″-1″ long. Receptacles sessile, globose, ·5″-·6″ in diameter, crowded near the ends of the branches, smooth, purple-black when ripe; basal-bracts 3, small, ovate, scarious. Male fl. sessile, scanty. Sepals 3, ovate, acuminate. Stamen 1; filament clavate, larger than the anther. Gall and fertile fl. alike. Sepals 3, ovate, longer than the ovoid achene. Style long; stigma very long, cylindric.

Western peninsula from the Konkan southwards to Ceylon, Carnatic; often planted in avenues and along road-sides. Fruit ripe Apl.-Oct. Bark smooth,

greenish-white, rather characteristic; with the green parenchyma very close to the surface. Wood grey with alternate bands of soft and hard tissue, moderately hard to soft, somewhat shining. Pores scanty, moderate-sized, subdivided. Medullary rays fine, equidistant, white and wavy. Weighs 34 lbs. to the cub. ft. A very common road-side tree throughout the Deccan and Konkan districts.

Fig 526. Ficus Tsiela, Roxb.

13. F. infectoria, Roxb. Fl. Ind. 3, 550; Fl. Br.I. 5, 515; Brandis For. Fl. 414; Bedd. Fl. Sylv. 222 (exclud. Syn.); King Sp. Fic. 60, t. 75 & t. 84, Fig. Y, 2; Gamble Ind. Timb. 645; Cooke Fl. Pres. Bomb. 2, 651; *Urostigma infectorium,* Miq. Fl. Ind. Bat. 1, part 2, 339; Dalz. & Gibs. Bomb. Fl. 241. *Bassari, dhed-umbara, pakari, lendva,* M. *Kari-basri,* K. *Pepri,* Guz. *Pipli, kaim,* Vern.

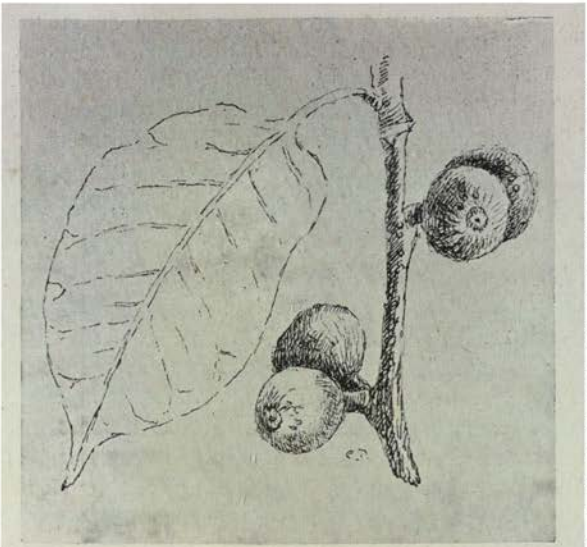

Fig 527. Ficus infectoria, Roxb.—Var. *Lambertiana*.

A large spreading, deciduous, glabrous, usually epiphytic tree, without aerial roots. Leaves ovate or ovate-oblong, 3·5″-7″ by 2″-3·5″, shortly acuminate at the apex, rounded, acute or subcordate at the base, thin; margins subundulate, entire; lateral-nerves 5-7 pairs, basal-pair not very prominent; petioles 1·5″-2·5″ long, channelled; stipules broadly ovate, ·5″ long, acute, yellowish-tomentose. Receptacles sessile, globose, about ·5″ in diameter, binate, axillary, white, flushed with red and dotted when ripe; basal-bracts 3, rounded, very small. Male fl. few, sessile near the mouth of the receptacle. Sepals 4-5, linear. Stamen 1; filament short; anther broadly ovate. Gall and fertile fl.: Sepals of the male. Style of the fertile flower long, of the gall flower short; stigma elongate.

Suliman and Salt Ranges. Outer Himalaya, Bengal, Assam, Burmah, Western peninsula, Ceylon; throughout the presidency, usually in dry, deciduous monsoon-forest, often planted along roadsides.

There are three distinct varieties of this species. Var. 1. *infectoria* proper, with large leaves acute at the base and with long petioles. Commonly planted throughout the presidency. Var. 2. *Lambertiana* has also large leaves but with shallow cordate bases and long petioles. Common in the N. Kanara monsoon-forests along the ghâts. In the Khandesh Akrani the fresh, delicate tinted, reddish-brown foliage of this variety appears in March or early in May; it soon turns to a bright-green colour. Var. 3. *Wightiana* has smaller leaves with narrowed bases and shorter petioles, is found in the southern parts of N. Kanara but is not so common as either of the other 2 varieties.

Bark grey, smooth scaly; inner-bark tough, fibrous, milky. Wood reddish-grey with narrow, concentric bands of soft tissue alternating with broader bands of harder tissue, moderately hard. Pores scanty, large, subdivided. Medullary rays moderately broad, uniform, equidistant. Wood used in Assam for firewood. The bark yields a useful fibre.

14. F. callosa, Willd. in Mem. Acad. Berl. (1798) 102, t. 4; Fl. Br. I. 5, 516; King Sp. Fic. 64, t. 85 & t. 84 Fig. V, 2; Cooke Fl. Pres. Bomb. 2, 651; *F. cinerescens,* Thw. Enum. 266; Bedd. Fl. Sylv. 224.

A very large evergreen tree with pearly juice, no aerial roots; branchlets warted. Leaves ovate or oblong, 5″-8″ by 2″-5″ (much larger on barren shoots) very shortly and obtusely acuminate at the apex, obtuse or subacute at the base, very coriaceous, hard and crustaceously brittle, glabrous, shining above, paler and subscabrid beneath when young, glabrous when old; lateral-nerves 8-15 pairs prominent below with strong reticulation between; petioles 1·5″-2″ long; stipules ovate-lanceolate, ·5″ long, pubescent. Receptacles subglobose, with hard, thick walls, peduncled, 1″-1·5″ in diameter, solitary, slightly depressed at the top, pubescent and scabrid, green when ripe; peduncles ·75″ long; bracts at top of peduncle 3, ovate pubescent; flowers intermixed with many ovate, lanceolate bracteoles. Male fl. numerous, pedicellate, scattered. Sepals 3, spathulate. Stamens 1 or 2; filaments short, slender; anthers small, ovate. Gall and fertile fl. similar. Perianth deeply 3-4-cleft; lobes broadly lanceolate. Style elongate, bifid. Ripe achenes obovoid.

Burmah, Andamans, Western peninsula, Ceylon, Java; throughout the Konkan and N. Kanara in rain-forest sparsely distributed, fairly common near Yellapore. Fr. ripe June-July.

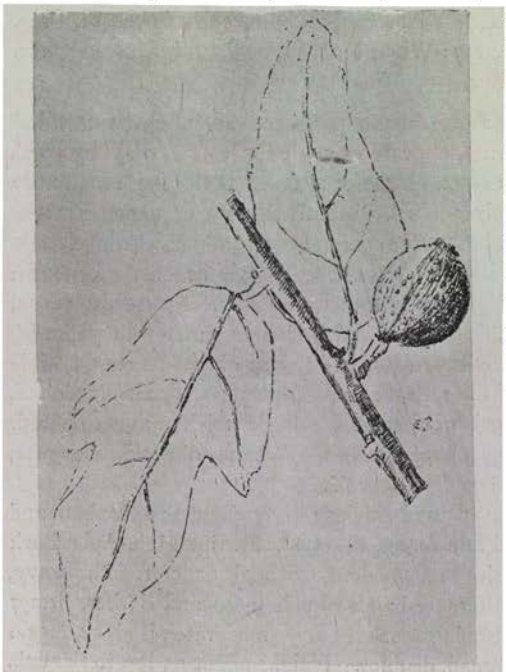

Fig 528. Ficus heterophylla, Linn.

A very large often tall tree of rapid growth. Bark smooth, grey, containing much pearly juice. Wood reddish-yellow with concentric bands of harder and softer tissue, moderately hard and mottled. Pores large, scanty, subdivided. Medullary rays moderately broad, uniform, not very numerous. Weighs 42 lbs. to the cub. ft.

15. F. heterophylla, Linn. f. Suppl. 442; Fl. Br. I. 5, 518; Dalz. & Gibs. Bomb. Fl. 243; King Sp. Fic. 75, t. 94; Cooke Fl. Pres. Bomb. 2, 652; Brandis For. Fl. 424; *F. acutiloba,* Miq. in Hook. Lond. Jour. Bot. 7, 227; Dalz. & Gibs. Bomb. Fl. 243. *Datir,* M.

A shrub, erect scandent or creeping over damp ground and rocks; branches pubescent. Leaves polymorphous, ovate or orbicular-ovate to lanceolate, 2″-5″ by 1·5″-3″, acuminate at the apex, obtuse, rounded or cordate at the base, entire or 3, many-lobed or margins repand-toothed, thin, scabrid on both surfaces; lateral-nerves 4-8 pairs, arched (palmate in the much lobed leaves); petioles ·5″-2·5″ long; stipules 2, ovate, scarious, about ·5″ long. Receptacles solitary, axillary, globose to pyriform, ·25″-1″ long, hispid, scabrid or warted with a prominent, open umbilicus, when ripe dark-orange and smooth; peduncles ·5″-1″ long; bracts minute, triangular, glabrous, basal or high up on the peduncle. Perianth of all flowers 3-4-cleft. Male fl.: Stamen 1. Gall fl.: Ovary ovoid, smooth; style short, lateral. Fertile fl.: Perianth hyaline, viscid, tubercled. Achene subglobose; style long, lateral; stigma cylindric.

Hotter parts of India from the Gangetic plain eastwards to Burmah and southwards to Ceylon; throughout the presidency,common along the banks of Deccan and Konkan rivers where it is often associated with *Phyllanthus Lawii* and *Eugenia Wightiana*. Fr. ripe May-June. The juice of the leaves and roots is employed in native medicine.

16. F. asperrima, Roxb. Fl. Ind. 3, 554; Fl. Br. I. 5, 552; Dalz. & Gibs. Bomb. Fl. 243; Bedd. Fl. Sylv. 224; King Sp. Fic. 80, t. 100; Cooke Fl. Pres. Bomb. 2, 653; Gamble Ind. Timb. 647; Wight Icones t. 633. *Khargas, gargata,* K. *Kharvat,* M. *Kal-amber,* Guz.

A small tree without aerial roots; young parts scabrid. Leaves crowded near the ends of the branches, ovate, obovate or ovate-lanceolate, 2″-5″ by 1″-3″, shortly acuminate or acute at the apex, obtuse or rounded at the the base, entire or sometimes irregularly and deeply 3-lobed, distantly serrate or crenate in the upper half, scabrid and hispid on both sides; lateral-nerves about 4 pairs, lowest pair basal, strong and prominent beneath, venation strongly reticulate beneath; petioles ·5″-2″ long; stipules minute. Receptacles solitary, depressed-globose, ·5″-·75″ in diameter, pedunculate, scabrous-hispid, yellow or purple with yellowish dots when ripe; peduncles minutely bracteate, ·1″-·2″ long; basal-bracts O. Male fl. numerous in the upper part of the receptacles. Sepals 4-5, linear-lanceolate, scabrid. Stamen 1. Gall fl.: Sepals of the male. Style thick; stigma dilated. Fertile fl.: Sepals 6-7, linear-lanceolate, smooth. Achene obovoid, elongate, minutely tubercled; style lateral; stigma obovoid.

Central India, Western peninsula and Ceylon; throughout the Konkan and N. Kanara in moist monsoon and rain-forest, common. Fr. ripe Mch.-Apl. Bark smooth white. Wood yellowish-grey, moderately hard or soft, with wavy, concentric often anastomozing, alternate bands of pale loose and darker, firmer tissue; warps and splits in seasoning. Pores few, moderate-sized or large. Medullary rays few, moderately-broad, distinct. Weighs about 23 lbs. to the cub.

ft. The rough leaves are extensively used instead of sandpaper for polishing wood in N. Kanara and the Konkan.

Fig 529. Ficus asperrima, Roxb.

17. F. hispida, Linn. f. Suppl. 442; Fl. Br. II. 5, 552; Brandis For. Fl. 423; Bedd. Fl. Sylv. 224; King Sp. Fic. 116, t. 154 & t. 155; Cooke Fl. Pres. Bomb. 2, 653; Gamble Ind. Timb. 647; *F. oppositifolia,* Willd. Sp. Pl. 4, 1151; Grah. Cat. Bomb. Pl. 191; *Covellia oppositifolia,* Gasp. Ricer. Caprif. 85; Dalz. & Gibs. Bomb. Fl. 243; *C. dæmonum,* Miq. in Hook. Lond. Jour. Bot. 7, 462; Dalz. & Gibs. Bomb. Fl. 244. *Kurwut,* Vern. *Kala-umber, kharoti, bokria, bhokada,* M. *Dhedu-mera,* Guz.

A shrub or small tree more or less hispidly pubescent in all parts. Leaves opposite, ovate or ovate-oblong, 4″-10″ by 2″-5″, cuspidate or very shortly caudate-acuminate at the apex, rounded, cuneate or subcordate at the base, entire or toothed above the middle, thin, shining and glabrescent above, more or

less scabrid beneath when young, glabrescent when old; lateral-nerves 3-5 pairs, lowest pair basal, prominent beneath; petioles ·5″-1·5″ long; stipules in pairs or in whorls of 4, ovate-lanceolate, ·5″ long, pubescent. Receptacles turbinate or obovoid, ·5″-1″ in diameter, axillary, pedunculate, in pairs or fascicled on short, tubercled branches from the old wood or on stipulate sometimes leafy branches often low down on the stems and sometimes hypogeal, yellowish when ripe with a large, ridged umbilicus, hispid, sometimes with scattered, lateral bracts; peduncles ·2″-·4″ long; basal bracts 3. Male fl. numerous near the base of the receptacles containing the gall flowers. Sepals 3, concave, hyaline. Stamen 1; anther broad, on a short filament. Gall fl. pedicellate. Perianth O. Ovary smooth, globose; style short, subterminal; stigma broad. Fertile fl.: Perianth thin, hyaline. Achenes ovoid; style long, hairy; stigma cylindric, tubular.

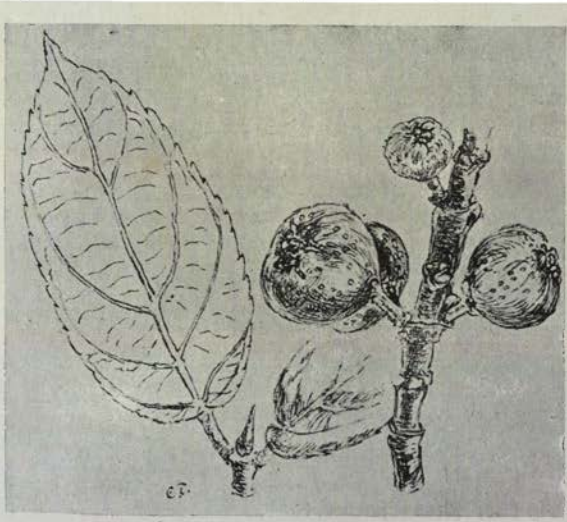

Fig 530. Ficus hispida, Linn.

Tropical India and Ceylon; throughout the Konkan and N. Kanara often along the banks of rivers and in moist situations, common in the evergreen forests near the seacoast. Fr. ripe H. & R. S. Bark thin, grey, rough, with horizontal rings encircling the branches and stems; inner-bark milky. Wood soft, grey, in regular, concentric bands of soft tissue alternating with equally broad bands of darker tissue, no heartwood. Pores scanty, moderate-sized, subdivided. Medullary rays moderately broad and fine. Weighs 35 lbs. to the cub. ft. The opposite leaves are characteristic of the species.

18. F. glomerata, Roxb. Fl. Ind. 3, 558; Fl. Br. I. 5. 535; Brandis For. Fl. 422; Bedd. Fl. Sylv. 224; King. Sp. Fic. 173, t. 218 A; Cooke Fl. Pres. Bomb. 2, 654; Gamble Ind. Timb. 650; *Covellia glomerata,* Miq. in Hook. Lond. Jour. Bot. 7, 465; Dalz. & Gibs. Bomb. Fl. 243. *Umbar,* M. *Rumadi, atti,* K. *Gooler,* Hind.

A moderate-sized or large deciduous tree without aerial roots; branchlets glabrous or scaberulous. Leaves ovate-oblong to lanceolate, 3″-6″ by 1·25″-2·5″,

tapering to a blunt point at the apex, obtuse or rarely acute at the base, thin, glabrous shining on both surfaces; lateral-nerves 4-6 pairs, lowest pair basal, strong beneath; petioles ·75″-2″ long; stipules ovate-lanceolate, scarious, pubescent. Receptacles shortly pedunculate, on short, leafless, warted branches from the stems or larger branches, subglobose, pyriform or subturbinate, 1·25″ in diameter, smooth or pubescent, red when ripe; umbilicus depressed; basal-bracts 3, triangular, ovate. Male, fertile, female and gall flowers on the same receptacle, the male in a zone near the mouth, the fertile female forming a layer near the walls of the receptacle and the gall flowers a more internal layer. Male fl. sessile. Sepals 3, membranous, inflated, enclosing the 2 elongate, ovate anthers; filaments connate. Gall fl. pedicelled. Perianth toothed, covering the base of the ovoid, rough ovary. Style lateral, elongate; stigma clavate. Fertile fl. subsessile. Perianth gamophyllous with 4-5 long, lanceolate teeth, enveloping the small, minutely tubercled achene; style subterminal, elongate; stigma clavate.

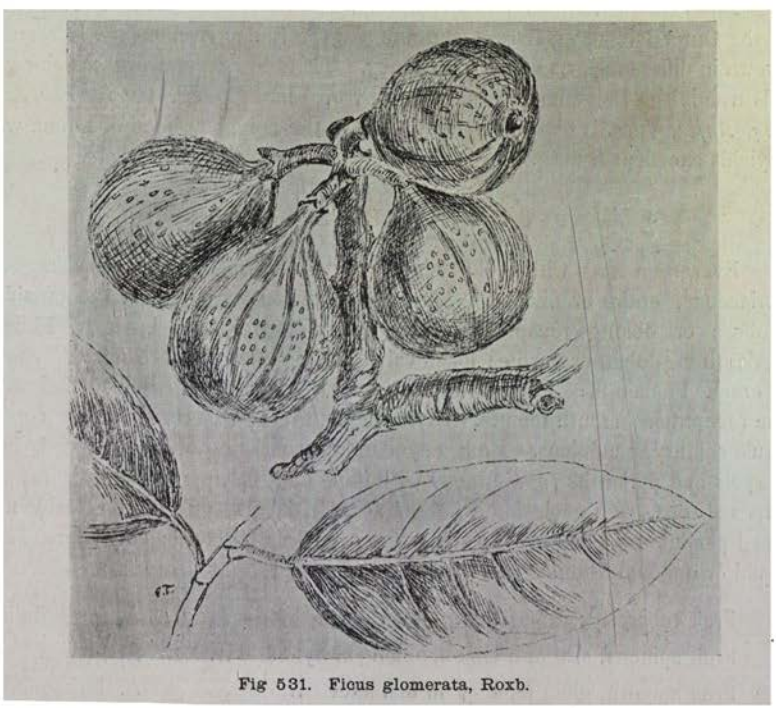

Fig 531. Ficus glomerata, Roxb.

Tropical India and Ceylon; throughout the presidency near villages and along the banks of streams and rivers. Fr. ripe at different times throughout the year. Bark thick, brownish-grey, rather smooth, scaly. Wood dull reddish-grey,

soft, with broad light-coloured bands of loose tissue alternating with narrower, interrupted bands of firmer tissue, mottled on a longitudinal section, durable under water, quickly decays when exposed to the weather. Pores large or moderate-sized, subdivided, scanty. Medullary rays moderately broad and fine. Weighs about 25 lbs. to the cub. ft. The wood is sometimes used for rough planking and is adapted for well-work owing to its durability under water. The leaves, bark and fruit are employed in native medicine. The fruit which is produced in great abundance is edible but nearly always full of insects; wild animals are very fond of it.

The juice is made into birdlime and in Ceylon is used as a remedy for diabetes by the Tamil coolies working in the tea gardens. *Umbar* is considered sacred by the Hindu kunbis in the Dharwar district; it is one of the best shade trees in the Mysore coffee plantations.

Ficus elastica, Roxb. Hort. Beng. 65. *The Indian Caoutchouc Tree* native of the Outer Himalaya, Assam, Burmah and the Malay Archipelago is frequently grown in different parts of the presidency. There are several fine specimens of this tree in the Belgaum fort. *Ficus carica,* Linn. Sp. Pl. 1059. *The Edible Fig. Anjir,* Vern. is extensively cultivated in the neighbourhood of Poona where it yields excellent fruit.

8. ARTOCARPUS, Forst.

Evergreen trees with milky juice. Leaves alternate, often very large and coriaceous, entire or divided. Flowers monœcious, minute, on the outside of globose or oblong receptacles often mixed with peltate bracts. Male fl.: Perianth 2-4-lobed or partite; lobes valvate or slightly imbricate in bud. Stamen 1, erect. Female fl.: Perianth tubular, entire, connate and confluent below with the receptacle; mouth minute. Style simple, usually exserted. Ovary 1-celled; ovule solitary, pendulous. Fruit a syncarpium consisting of the enlarged, fleshy carpels and perianths *(anthocarps)* with hardened, flat, pyramidal or spinescent, exposed tops, each enclosing a nut or achene deeply sunk in the fleshy mass. Seed pendulous; albumen O; embryo straight or incurved; cotyledons fleshy, equal or unequal; radicle short, superior.

Fruit tubercled, 12″-24″ long, oblong or cylindric ...	1.	A. integrifolia.
Fruit spinous, size of a lemon, oblong or cylindric ...	2.	A. hirsuta.
Fruit smooth, globose, 2″-3″ in diameter	3.	A. Lakoocha.

1. A. integrifolia, Linn. f. Suppl. 412; Fl. Br. I. 5, 541; Brandis For. Fl. 425; Dalz. & Gibs. Bomb. Fl. 244; Bedd. Fl. Sylv. 219; Cooke Fl. Pres. Bomb. 2, 657; Gamble Ind. Timb. 652, *Halsina-mara,* K. *Phunnas,* M. *The Jack Tree.*

A large glabrous evergreen tree. Leaves obovate-oblong to oblong, 4″-8″ by 3″-5″, acuminate at the apex, acute at the base, entire or 3-lobed, thickly coriaceous, dark-green glossy above; lateral-nerves 7-8 pairs, strong beneath; petioles ·5″-1″ long, slender; stipules large, lanceolate, spathaceous, early caducous. Flowers in axillary or terminal, often binate, clavate-oblong, pedunculate heads usually from the main branches and trunk, enclosed in spathaceous, deciduous sheaths; peduncles ·75″ long, at first slender afterwards thickening. Male fl. in cylindric or clavate-oblong heads 2″-6″ long by 1″-2″ in diameter; bracteoles O. Sepals 2, oblong or spathulate, pubescent at the tips. Female fl.: Anthocarps pyramidal with flattish, acute tips. Fruit a cylindrical syncarpium rounded at the ends, 12″-30″ by 6″-12″, hanging on short, thick stalks; seeds kidney-shaped or oblong, about the size of a nutmeg, enveloped in a thin, white, coriaceous, smooth testa and enclosed in the yellow, fleshy, enlarged perianths.

Western peninsula from the Konkan southwards up to 4000′; very probably indigenous as it is often found in rain-forest quite remote from human habitations, commonly cultivated throughout tropical India, Burmah and Ceylon, often planted along roadsides in the N. Kanara district. An important and valuable fruit tree. Bark thin, blackish, scaly, deeply fissured; inner-bark bright-yellow, corky. Wood moderately hard; sapwood pale, heartwood bright-yellow, darkening on exposure, compact, even-grained; seasons well. Pores of different sizes in irregular patches of soft tissue, often containing resin. Medullary rays fine to moderately broad, not numerous. Weighs about 40 lbs. to the cub. ft. An excellent timber much in demand in N. Kanara for carpentry, furniture and cabinet-work. An ornamental wood, which takes a fine polish. The principal product of the tree is the very large fruit of which all the inner parts are eaten. Next to the *Mango* and *Plantain* the *Jack* is the most important Indian tree-fruit. A yellow dye is extracted from the wood chips in Burmah where it is used to colour the garments worn by the Buddhist priests. The bark yields a transparent gum and the juice is made into birdlime. Rubber is contained in the sticky juice of the fruit.

2. A. hirsuta, Lamk. Encycl. 3, 201; Fl. Br. I. 5, 541; Brandis For. Fl. 26; Bedd. Fl. Sylv. t. 308; Dalz. & Gibs. Bomb. Fl. 244; Cooke Fl. Pres. Bomb. 2, 656; Gamble Ind. Timb. 652. *Ran* or *patphunnas,* M. *Hebhulsina-mara*, K. *The Anjeli Wood Tree.*

A large or very large lofty evergreen tree; branchlets and young parts strigose with long, tawny, adpressed hairs. Leaves broadly ovate, obovate or elliptic, 6″-9″ by 4″-6″, subacute or very shortly acuminate at the apex, slightly narrowed and rounded at the base, coriaceous, entire or sometimes deeply pinnatifid and serrate (on the young shoots up to 15″ by 10″ with acuminate lobes), glabrous above, pubescent on the midrib and nervation beneath, hispidulous on the underside of leaves from saplings and young shoots; lateral-nerves about 10 pairs very

strong and prominent beneath; petioles ·5″-·75″ long, stout, yellow hairy; stipules lanceolate, nearly 1″ long, yellow hairy. Flowers on axillary or terminal pedunculate receptacles; male solitary or in pairs, narrow, cylindric, 3″-4″ long, erect, ultimately pendulous; peduncles stout, hairy, half as long as the recepatcles; female solitary, ovoid, about 1″ long by ·75″ broad and thick, on peduncles about 3″ long. Male fl.: Sepals 2, connate below. Stamen 1; anthers ovate, exserted. Receptacle scales (bracteoles) numerous, linear, scarious. Female fl.: Perianth tubular, confluent below with the receptacle. Fruit ovoid, 3·5″ by 2″; size of a lemon, armed with numerous hispid spines (free tips of the anthocarps); seeds numerous, ovoid, ·5″-·75″ long.

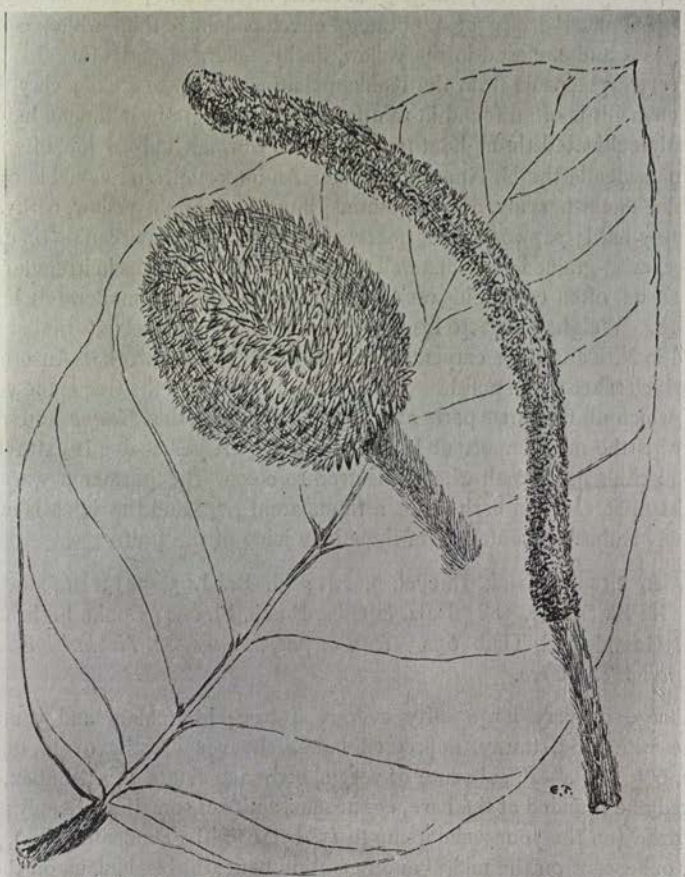

Fig 532. Artocarpus hirsuta, Lamk.

Western peninsula on the ghâts from the Konkan southwards up to 4000′, common in the rain-forests of N. Kanara also in Mysore and the Madras presidency. Fl. Jan.-Feb. Fr. ripe May. Bark dark-coloured, scaly. Wood moderately-hard ; sapwood white ; heartwood yellowish-brown, seasons well. Pores large, sometimes subdivided, enclosed, in narrow rings of soft tissue, prominent on a longitudinal section. Medullary rays moderately-broad, prominent, distinct. Weighs from 36 to 40 lbs. to the cub. ft. The wood is especially valuable as it neither warps nor is attacked by white ants, is much in demand on the Western coast for house and ship-building purposes also makes excellent furniture.

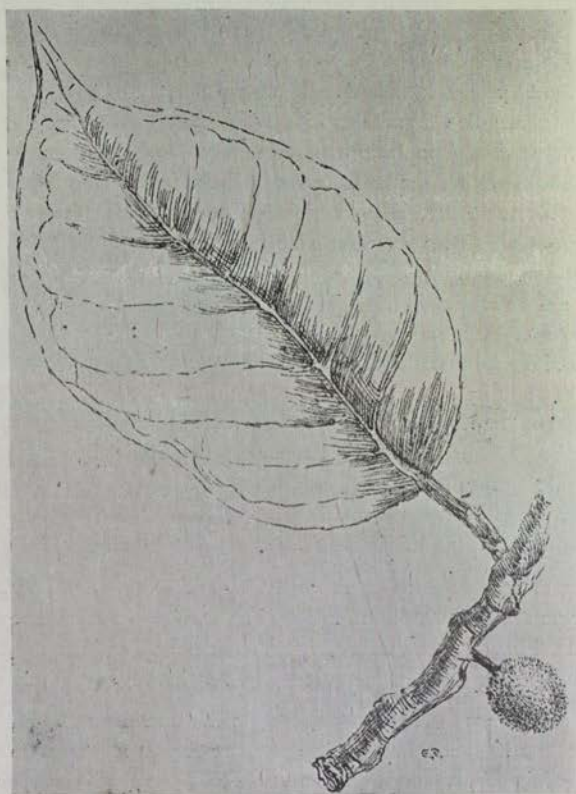

Fig 533. Artocarpus Lakoocha, Roxb.

3. A. Lakoocha, Roxb. Fl. Ind. 3, 524; Fl. Br. I. 5, 543; Brandis For. Fl. 426; Dalz. & Gibs. Bomb. Fl. 244; Bedd. Fl. Sylv. 219; Cooke Fl. Pres. Bomb. 2, 657; Gamble Ind. Timb. 655, *Wotomba*, *badhar*, M. *Wontemara*, K. *Lowi*, Vern.

A large deciduous tree; branchlets densely grey or rusty-tomentose. Leaves ovate or obovate, 3·5″-12″ by 2″-6″, shortly finely acuminate or cuspidate at the apex, truncate or subcordate at the base; margins entire sometimes serrate or subundulate in the young leaves, coriaceous, glabrous shining above, densely grey-downy beneath; lateral-nerves 8-12 pairs prominent and with a fine, distinct reticulation between beneath; petioles ·5″-1″ long; stipules small, pubescent, caducous. Flowers in shortly pedunculate or subsessile, axillary, globose heads

·5″-1″ in diameter; bracteoles peltate. Male fl.: Sepals on subsessile receptacles. Sepals 3-4, triangular, truncate, puberulous. Stamen 1; filament broad at base, tapering upwards; anther exserted, broad, 2-celled. Female fl. on shortly peduncled receptacles. Anthocarps flat, smooth at the apices, completely united. Fruit oblong, irregularly globose, 2″-3″ in diameter, minutely velvety, yellow when ripe, edible; seeds oblong, ·1″ thick, flat.

Tropical Himalaya from Kumaon eastwards to Burmah and southwards to Travancore up to 4000′, Assam, Eastern Bengal, Burmah, moist region of Ceylon, Andamans, often cultivated. Western peninsula up to 3000′, Konkan and N-Kanara in rain-forest, common in the jungles near Yellapore. Fl. Mch.-Apl. Fr. ripe July-Aug.

Bark dark-coloured, rough, without furrows. Wood hard; sapwood large, white and soft; heartwood yellow, hard, shining, mottled. Pores large, oval, often filled with white gum and enclosed in soft tissue, uniformly distributed. Medullary rays moderately broad, distinct, prominent. Weighs about 56 lbs. to the cub. ft. An excellent timber neither attacked by white ants nor by the teredo; used for a variety of purposes in N. Kanara, house-posts, piles in water, canoes, furniture etc. The fruit is eaten either raw or pickled. Pieces of the fruit are frequently seen drying in the sun near the houses of the Haigas in N. Kanara. The wood merits the attention of the Forest Department in N. Kanara.

9. ANTIARIS, LESCHEN.

Evergreen trees. Leaves alternate, bifarious, stipulate; stipules small, connate, caducous. Flowers monœcious, male crowded on the surface of an axillary, pedunculate, fleshy disk, surrounded by confluent, imbricating bracts; female in a 1-flowered, urceolate involucre many-cleft at the apex. Male fl.: Sepals 4, spathulate, imbricate. Stamens 3-8; filaments short or O; anthers 2-celled, extrorse. Pistillode O. Female fl.: Perianth O. Ovary 1-celled adnate to the involucre; ovule solitary, pendulous from the top of the cell; style terminal, bifid. Fruit fleshy. Seed exalbuminous; testa hard; embryo subglobose; cotyledons equal, fleshy; radicle small, superior.

A. toxicaria, Leschen. in Ann. Mus. Paris 16, 478, t. 22; Fl. Br. I. 5, 537; Cooke Fl. Pres. Bomb. 2, 655; Gamble Ind. Timb. 651; *A. innoxia*, Blume Rumphia, 1, 172, t. 54; Bedd. Fl. Sylv. t. 307; Brandis For. Fl. 427; *A. saccidora*, Dalz. in Kew Jour. Bot. 3, 232; Dalz. & Gibs. Bomb. Fl. 244; *Lepurandra saccidora*, Nimmo in Grah. Cat. Bomb. Pl. 193. *The Upas or Travancore Sacking Tree. Ajjanpatte*, K. *Karvat, chandkura*, M. *Jassoond, chandul*, Vern.

An immense tree buttressed at the base; branchlets yellow-pubescent. Leaves oblong or ovate-oblong, 3″-6″ by 1·5″-2·5″, acuminate, cuspidate or caudate

at the apex, truncate or subcordate at the base, entire or serrulate, thinly coriaceous, scabrid, shining above, paler and pubescent beneath; lateral-nerves 8-10 pairs with distinct, reticulate venation between; petioles ·2″ long, stout, pubescent. Receptacles monœcious; male 3-4 together, orbicular, ·5″ in diameter, tomentose, at length convex; peduncles velvety; female solitary, axillary, subsessile, ovoid, velvety, in an involucre of numerous confluent bracts. Male fl.: Sepals 3-4, narrowly spathulate. Stamens 5-8; filaments erect. Female fl.: Perianth O. Ovary adnate to the involucre, 1-seeded. Fruit pyriform or globose, flattened, ·75″ by ·5″, reddish-brown, velvety; peduncle ·5″ long.

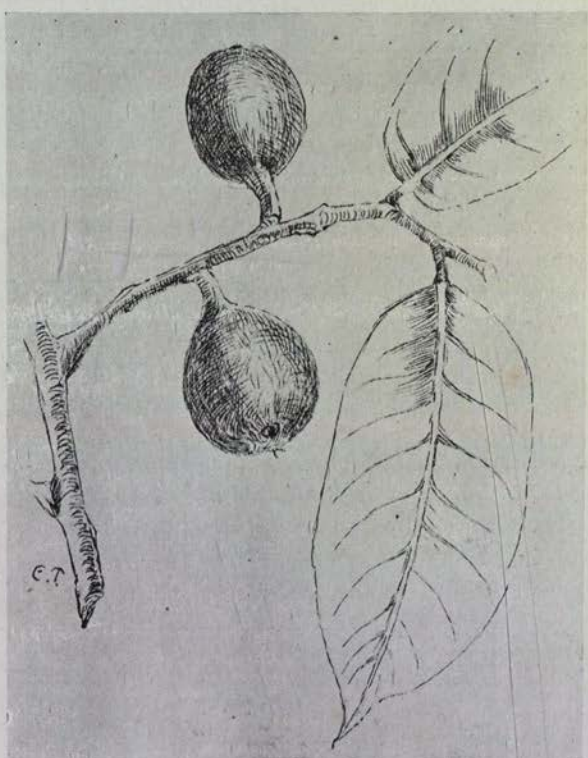

Fig 534. Antiaris toxicaria, Leschen.

Tropical India, Burmah, Pegu, Ceylon, Western peninsula, Malay peninsula and Archipelago, The Konkan and N. Kanara in rain-forest, common near Yellapore. Fl. Sept.-Oct. Fr. ripe C. S. An immense buttressed, quick growing tree of great height and large diameter. Bark dark-coloured, hard, smooth. Wood grey, soft and light. Annual-rings visible but rather indistinct. Pores mode-

rate-sized and large often in groups and joined by light-coloured tissue. Medullary rays moderately broad, uniform, prominent. Weighs about 28 lbs. to the cub. ft. The inner-bark yields a good fibre suitable for cordage. Pieces stripped whole from stems or large branches with a section of wood at the bottom make rough sacks used for carrying rice in parts of Travancore. Coats and other garments worn by the ghât kunbis during the Holi festival are also manufactured from this bark. The clebrated "*upas antiar*" poison used for poisoning arrows is prepared in Java and the islands of the Malay Archipelago from the milky juice of this tree.

10. BŒHMERIA, JACQ.

Pubescent shrubs or small trees. Leaves opposite and alternate, toothed, 3 basal-nerved; stipules usually free, deciduous. Flowers monœcious or dicœcious in axillary, sessile, spiked, racemed or panicled, unisexual clusters. Male fl.: Perianth 4-lobed; lobes valvate. Stamens 3-5, inflexed in bud. Pistillode clavate. Female fl.: Perianth tubular, compressed or ventricose with a narrow, 2-4-toothed mouth. Ovary 1-celled included in the perianth; ovule solitary, erect. Achene crustaceous, dry, enclosed in the perianth, ultimately free. Seeds with a membranous testa, albuminous; cotyledons ovate.

Flower-clusters axillary. Leaves alternate ...	1. B. malabarica.
Flower-clusters in simple or paniculate spikes. Leaves mostly opposite	2. B. platyphylla.

1. B. malabarica. Wedd. Monagr. 355; Fl Br. I. 5, 578; Cooke Fl. Pres. Bomb. 2, 635; *B. travancorica*, Bedd. Fl. Sylv. 225 & Anal. Gen. t 27, Fig. 2 (by error *B. ramiflora*).

An erect shrub or small tree; branches terete, pubescent. Leaves subequal or alternately large and small, ovate or ovate-oblong, larger 4″-8″ by 2″-4″, smaller 1·5″-2·5″ by ·75″-1″, cuspidately acuminate at the apex, rounded or subcordate at the base, crenulate or serrate in the upper 2/3, membranous, glabrous and minutely white-dotted above, pubescent beneath; basal-nerves 3, distinct, slender with a strong raised reticulation between and 2-3 pairs of distinct lateral-nerves above; petioles ·5″-3″ long; stipules small, linear, caducous. Flowers monœcious, minute, white, in small sessile, axillary clusters. Male fl.: Perianth 4-partite, pubescent. Stamens 4. Pistillode subglobose. Female fl.: Perianth tubular, 4-toothed, pubescent. Achenes ovoid, enclosed in the ovate, truncate, puberulous perianth.

Sikkim Himalaya up to 5000′, Chittagong, Tenasserim, Western peninsula from the Konkan southwards; throughout the Konkan and N. Kanara in rain-

forest, very abundant on the Siddapore ghâts. Fl. Nov. Feb. Fr. H. S. The inner-bark yields a very strong and tenacious fibre which is easily extracted.

2. B. platyphylla, Don. Prodr. 60; Fl Br. I. 5, 578; Brandis For. Fl. 403; Gamble Ind. Timb. Timb. 658; *B. scabrella,* Gaud. in Freyc. Voy. 500; Cooke Fl. Pres. Bomb. 2, 638; *Splitgerbera, scabrella*, Dalz. & Gibs. Bomb. Fl. 239; *Urtica scabrella*, Roxb. Fl. Ind. 3, 581; Wight Ic. t. 691.

A large shrub; branches slender, grooved, sparsely strigose. Leaves usually opposite, broadly ovate, 3″-6″ by 2″-4″, shortly acuminate or caudate at the apex, rounded or subcordate at the base, sharply triangular serrate, wrinkled on both surfaces, membranous, sparsely pubescent above, scaberulous and pale beneath; 3 basal-nerved, each nerve 8-10 penni-nervuled; petioles 1″-5″ long, slender; stipules triangular-lanceolate. Flowers in remote, small, rounded clusters on long slender, simple or branched, erect spikes 6″-12″ long. Male fl.: Sepals 4, ovate-acuminate. Stamens 4. Pistillode ovoid. Female Fl.: Perianth somewhat flask-shaped, usually with a small, unequally 4-toothed mouth. Style filiform, pubescent, exserted. Achene crustaceous, shining, enclosed in a gibbous, compressed, stipitate, pubescent perianth.

Tropical India, Ceylon up to 6000′; throughout the presidency, common in moist monsoon and rain-forest near the seacoasts of the Konkan and N. Kanara. Fl. Apl.-Oct. Fr. R. S. Bark thin, greyish-brown, longitudinally striated. Wood moderately hard, reddish-brown with concentric bands of lighter and darker tissue. Pores moderate-sized, scanty. Medullary rays moderately broad, distant. Inner-bark yields a strong fibre which is easily extracted.

11. DEBREGEASIA, GAUD.

Trees or shrubs. Leaves alternate, serrate, basal triplenerved, often ashy-white tomentose beneath. Flowers monœcious or dicœcious in axillary, pedicelled, bracteate heads or cymes; cyme-branches divaricate. Male fl.: Perianth 3-5-partite; lobes valvate in bud. Stamens 3-5 (usually 4). Pistillode oblong, glabrous or woolly at the base. Female fl.: Perianth tubular, dilated below; mouth contracted, 4-toothed. Ovary adnate to the perianth, 1-celled; ovule solitary, erect; stigma sessile, penicillate. Fruit a head of more or less fleshy perianths and contained achenes, often yellow. Seed with a membranous testa; albumen copious; cotyledons broad, short.

D. velutina, Gaud. Bot. Voy. Bonite, t. 90; Fl. Br. I. 5, 590; Cooke Fl. Pres. Bomb. 2, 640; Gamble Ind. Timb. 660; *D. longifolia,* Wedd. in DC. Prodr. 16, 1, 235-24; Brandis For. Fl. 405; *Morocarpus longifolius,* Blume Mus. Bot. Lugd. Bat. 2, 156; Bedd. Fl. Sylv. 226, t. 26, f, 5; *Conocephalus niveus,*

Wight Ic. t. 1959; Dalz. & Gibs. Bomb. Fl. 239; *Bœhmeria ramiflora,* Grah. Cat. Bomb. Pl. 187 (not of Jacq.) *Kapsi, kurgul,* Vern.

A large shrub or small tree; branches pubescent or tomentose. Leaves linear-lanceolate or oblong-lanceolate, 4″-7″ by 1·25″-2″, finely acuminate at the apex, cuneate or rounded at the base, serrulate, rugulose, smooth or scabrid above, ashy-white tomentose beneath; basal-nerves 3, very long; lateral-nerves 2-3 pairs above; petioles 1″ long; stipules chaffy, ·25″ long, bifid at the apex. Flowers monœcious, mixed with numerous bracteoles, in small, compact heads on dichotomous, axillary cymes; peduncles and pedicels hairy. Male fl.: Sepals 4, longer than the bracteoles. Stamens 4. Female fl.: Perianth tubular with a small 4-toothed mouth. Fruit yellow, resembling a small raspberry, edible, consisting of numerous, minute achenes enclosed in the obovoid, stipitate perianths.

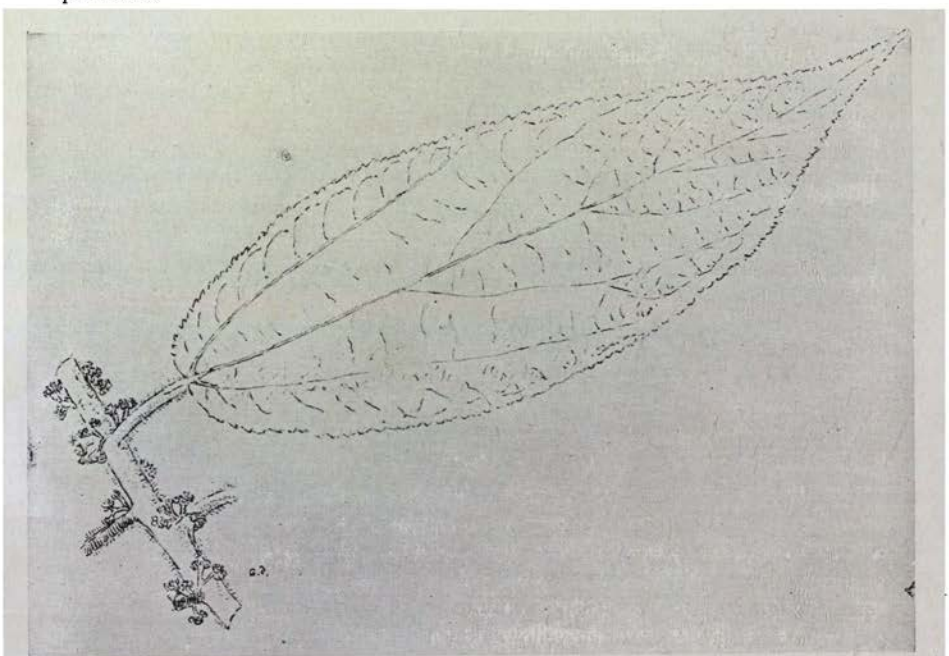

Fig 535. Debregeasia velutina, Gaud.

Outer subtropical Himalaya from Kumaon to Sikkim 3-6000′, Assam and the Khasia Hills, Deccan, Western peninsula from the Konkan to Ceylon, Nilgiris up to 7000′; common in the Konkan and N. Kanara in rain-forest often in old cultivated lands and near rivers and watercourses. Fl. Nov.-Jan. Fr. Dec.-Feb.

"Bark thin, greyish-brown, rough. Wood reddish-brown, hard. Pores moderate-sized, scanty; annual-rings distinct. Medullary rays moderately broad, uniform" Gamble. The inner-bark yields a strong fibre used for ropes and fishing nets, sometimes called "*Wild Rhea*" in Ceylon.

MORUS, LINN.

Trees or shrubs. Leaves alternate, simple; stipules small, lateral, deciduous, Flowers monœcious or diœcious, spikate. Male fl.: Sepals 4. Stamens 4, opposite to and longer than the calyx; filaments flattened at the base; anther-cells introrse. Pistillode rudimentary. Female fl.: Sepals 4, accrescent in fruit. Ovary 1-celled; ovule solitary, pendulous; style central, bipartite or bifid. Fruit a syncarpium of achenes included in the succulent perianths. Albumen fleshy; cotyledons equal; embryo incurved; radicle ascending, incumbent.

M. alba, Linn. Sp. Pl. 986; Fl. Br. I. 5, 492; Brandis For. Fl. 407; Gamble Ind. Timb. 634; Cooke Fl. Pres. Bomb. 658. *The White or Black Mulberry. Tut.* Vern.

A medium-sized, deciduous tree with ovate, cordate, dentate leaves and cylindric, dark-purple or white, juicy fruit is cultivated in gardens for its fruit and leaves which latter like those of *Morus indica* are used for feeding silkworms. "The home of the *Black Mulberry* is unknown that of the *White Mulberry* is probably China" Brandis.

M. indica, Linn. Sp. Pl. 986; Fl. Br. I. 5, 942; Brandis For. Fl. 408; Gamble Ind. Timb. 635; Cooke Fl. Pres. Bomb. 2, 658. *Tut, ambat,* M.

A deciduous shrub or small tree with rough, ovate, long-acuminate, sharply serrate often deeply lobed leaves and ovoid or subglobose black fruit was formerly experimentally cultivated in the Deccan but with after a 12 years' trial the attempt at introduction was abandoned in 1846. Is established near villages in N. Kanara and Belgaum where the conditions of soil and climate better suit the species. Dr. Stewart considered *M. alba* and *M. indica* to be identical. The differences between the two species are chiefly in the more or less connate, glabrous or hairy, short or long styles and in the length of the leaf acumination.

M. lævigata, Wall. Cat. 4649; Fl. Br. I. 5, 492; Brandis For. Fl. 409; Gamble Ind. Timb. 636; Cooke Fl. Pres. Bomb. 658. *Tut.* Vern.

A small deciduous tree with ovate, shortly acuminate, often cordate leaves and a long cylindrical, yellowish-white, succulent, insipid fruit, indigenous in the N. W. Himalaya, is cultivated in gardens in Dharwar and Belgaum and probably elsewhere throughout the presidency. Fl. C. S. Fr. H. S. Wood suitable for cabinet-work and furniture. Fruit insipid.

Laportea crenulata, Gaud. in Freyc. Voy. Bot. 498. A large evergreen shrub covered with dangerously irritating stinging hairs and known as the *Fever* and *Devil-nettle* and Villebrunea integrifolia, Gaud. Voy. Bonite. t. 91. A small evergreen tree with elliptic-oblong, membranous leaves and globose clusters of flowers arranged in axillary, crowded, forked, hispid cymules were included in my Trees etc. Bomb. (1902) but are excluded from the present work as they are not indigenous in the Bombay presidency. Conocephalus concolor, Dalz. in Dalz. & Gibs. Bomb. Fl. 239." Shrubby. Leaves very large, 12" long, irregularly scattered, 3-nerved, perfectly smooth, oblong-ovate acute, green on both sides. Female flower axillary. Deccan, Phoonda ghát." The above description is taken from Dalz. & Gibs. Bomb. Fl. The plant has not been found by any other subsequent collector as far as I can ascertain; it should be looked for in the above mentioned locality.

Order LXXXIV.—CASUARINACEÆ.

Leafless trees or shrubs; branches cylindric, drooping, grooved, and jointed; internodes with a ring of small scales. Flowers unisexual, monœcious or dicœcious, whorled about the articulations of the rachis which is jointed in the male or sometimes not jointed in the female; male in terminal spikes; female in ovoid, bracteate and 2-bracteolate heads. Male fl.: Sepals 2, connate at the apices and circumcissile at the base forming a calyptra over the anther. Stamen 1, inflexed in bud; anther 2-celled; cells parallel, longitudinally dehiscent. Female fl.: Perianth 0. Ovary minute, 1-celled; ovule solitary, ascending, orthotrope or ovules 2, collateral; style bifid, arms filiform, stigmatose to the base. Fruit a small cone formed of the hardened bracts and bracteoles enclosing the winged achenes. Seeds densely coated with spiral vessels, exalbuminous; radicle superior.

CASUARINA, FORST.

Generic characters same as those of the order.

C. equisetifolia, Forst. Char. Gen. 103, f. 53; Fl. Br. I. 5, 598; Brandis For. Fl. 453; Bedd. Fl. Sylv. t. 226; Gamble Ind. Timb. 665; Cooke Fl. Pres. Bomb. 2, 660; Dalz. & Gibs. Bomb. Fl. Suppl. 82; *C. muricata*, Roxb. Fl. Ind. 3, 519. *The Beef-wood of Australia*, *Sura,* M.

A large evergreen glabrous tree; branchlets thin, filiform, slender, jointed; internodes about ·25″ long, 6-8-angled with as many teeth at the ends as there are angles. Male spikes terminal, linear, cylindric, at the extremities of the branchlets, about ·5″ long. Female spikes peduncled, red, shortly jointed, with subulate teeth at the apex. Fruit ovoid-globose, about ·5″ long, consisting of about 12 rows of valvately dehiscent achenes.

Coasts of Chittagong and Burmah, the Andamans (Casuarina bay in the Great Andaman), cultivated elsewhere. In the presidency there are large plantations of this tree in N. Kanara on the sands near the seacoast, often planted inland as an ornamental tree in gardens also along roadsides. Fl. Sept.-Oct. Fr. ripe June. Bark scaly, dark-coloured, peeling off in vertical strips. Wood brown, very hard, cracks and splits, difficult to work. Pores moderate-sized, much subdivided, in radial and oblique lines. Medullary rays very fine, uniform, equidistant, crossed by numerous, wavy, concentric lines of soft tissue containing small pores. Weighs about 60 lbs. to the cub. ft. Wood chiefly used for fuel. The bark is used for dyeing fishermen's nets near Madras.

Order LXXXV.—SALICACEÆ.

Trees or shrubs. Leaves alternate, stipulate. Flowers diœcious, bracteate, in lateral catkins which are similar in both sexes; bracts spirally arranged each bearing a single flower in its axil; bracteoles O. Perianth O. Disk of one or more scales or cup-shaped. Male fl.: Stamens 2 or more; filaments free or connate; anthers longitudinally dehiscent. Pistillode in normal flower O. Female fl. sessile or stalked, 1-celled; ovules few or many, erect, anatropous on 2-4 placentas; style short or O. Capsule 2-4-valved. Seeds few or many, each with a pencil of long hairs from the funicle; albumen O; cotyledons planoconvex; radicle short, inferior.

Leaves short-petiolate. Disk of 1-2 separate glands	1.	Salix.
Leaves long-petiolate. Disk membranous, cup-shaped or annular	2.	Populus.

1. SALIX, LINN.

Trees or shrubs. Leaves lanceolate, short-petioled; stipules various. Flowers small, diœcious, usually in dense, bracteate catkins; bracts small, entire. Perianth O. Disk usually of 1 or 2 glands or scales. Male fl.: Stamens 2-12 (in most species 2); filaments long, filiform; anthers usually small. Female fl.: Ovary sessile or stalked; placentas 2; ovules 2-seriate on each placenta, usually 4-8; style usually short with 2 short, retuse or bifid arms. Capsule 2-valved; valves usually rolling back. Seeds few or many, each with a penicillate funicle; albumen O; cotyledons planoconvex; radicle inferior.

Capsule glabrous, pedicelled	1.	S. tetrasperma.
Capsule densely woolly, subsessile	2.	S. ichnostachya.

S. tetrasperma, Roxb. Fl. Ind. 3, 573; Fl. Br. I. 5, 626; Brandis For. Fl. 462; Bedd. Fl. Sylv. t. 302; Wight Ic. t. 1954; Dalz. & Gibs. Bomb. Fl. 220; Cooke Fl. Pres. Bomb. 2, 661; Gamble Ind. Timb. 685. *Bocha, bitsa,* M. *Walunj.* Vern. *Niranji.* K.

A small or moderate-sized deciduous tree; branchlets and young shoots white silky-hairy. Leaves lanceolate or ovate-lanceolate, 2″-5″ by ·5″-1·5″, acute or acuminate at the apex, acute at the base, minutely and regularly serrulate,

sometimes nearly entire, bright-green glabrous above, more or less silky pubescent, when young, glaucous beneath, often persistent and subcoriaceous; lateral-nerves numerous, slender; petioles ·2"-·5" long; stipules linear subulate, early caducous. Flowers appearing with the young leaves; catkins hairy, 2"-5" long; peduncles leafy, pubescent. Male fl. sweet-scented, in lax, drooping catkins with the rachis, scales and base of filaments white silky-hairy; bracts ovate, concave, veined. Disk of 2 yellow glands. Stamens 5-10, free; filaments slender, glabrous; anthers minute, elliptic, yellow. Female fl. on slender pedicels ·15" long; bracts ovate, acute, shorter than the pedicels, white hairy. Disk small, semicircular, yellow, clasping the pedicel at the side opposite the bract. Ovary ovoid, glabrous; ovules usually 4; styles 2, spreading. Capsules glabrous, ·15" long, often in groups of 3-4; valves recurved and rolling back at the tips.

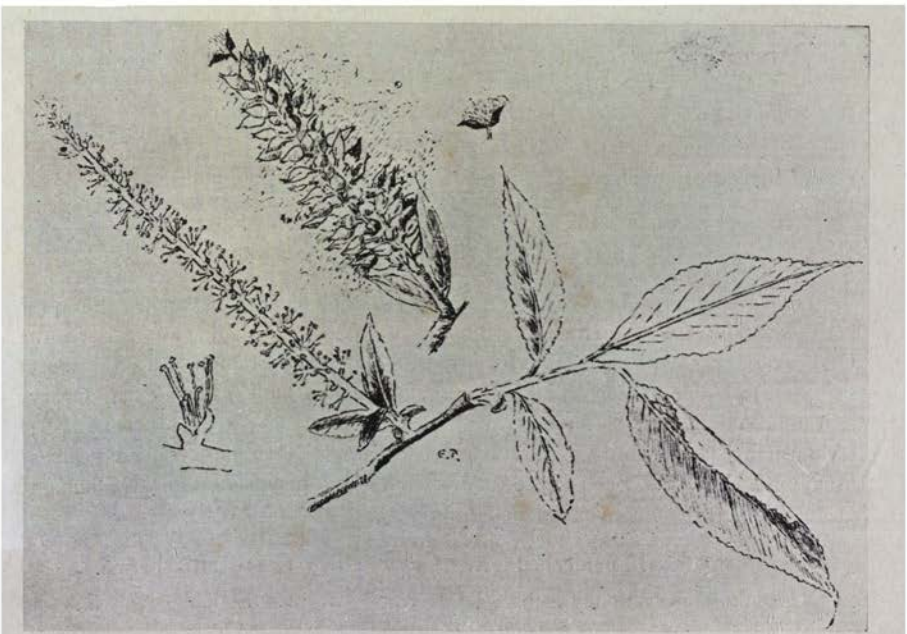

Fig 536. Salix tetrasperma, Roxb.

Tropical, and subtropical India, Burmah, Himalaya and hills of Southern India up to 7000,′ Malay peninsula and Java, absent from Ceylon, usually along river-banks and in moist places, planted along roadsides and near fields in eth Belgaum district. Fl. Oct.-Nov. A fine, moderate-sized or large tree. Bark rough with deep, vertical fissures. Heartwood red, soft, porous and evengrained.

Annual-rings indistinct. Pores small, numerous, sometims subdivided. Medullary rays fine, numerous, indistinct. Weighs about 32 lbs to the cub. ft. Wood not much used in the presidency, principally for firewood and charcoal. The branches are made into baskets. The bark contains tannin.

2. S. ichnostachya, Lindl. in Wall. Cat. 3704; Fl. Br. I. 5, 628; Wight. Ic. 1953; Cooke Fl. Pres. Bomb. 2,662; Gamble Ind. Timb. 685.

A moderate-sized tree; young parts pubescent. Leaves ovate or elliptic-lanceolate, 2·5″-6″ by 1·5″-3″, acute or finely acuminate at the apex, rounded or acute at the base, crenate-serrate, glabrous or sparsely pubescent above, more or less pubescent and glaucous beneath; lateral-nerves numerous, slender; petioles ·5″-·75″ long, slender, glabrous or pubescent. Flowers in axillary, leafy, woolly catkins along with the young leaves. Male fl.: Bracts ovate, densely woolly. Stamens 6-8; filaments long, slender, glabrous. Female fl. very shortly pedicelled or subsessile; bracts smaller than in the male, densely tomentose. Ovary sessile; style sessile, bifid. Capsule globosely ovoid, ·15″ long, densely white woolly; valves ultimately glabrous, recurved at the tips.

Western peninsula from the Konkan to Mysore, Pondicherry. N. Kanara, and the Konkan along banks of streams and rivers. Fl. Oct.-Nov. A common species differing from *S. tetrasperma* chiefly by the densely woolly, nearly sessile, globosely ovoid capsules. Dr. Cooke finds that many of Wight's specimens in the Kew Herbarium have the catkins androgynous. Wood white, soft.

S. babylonica, Linn.; Fl. Br. I. 5, 620; Gamble Ind. Timb. 688; Brandis For. Fl. 465. *The Weeping Willow.*

A moderate-sized deciduous tree of fast growth with drooping branches, narrowly lanceolate leaves and sessile, glabrous capsules is occasionly cultivated in gardens near Bombay and Poona.

2. POPULUS, Linn.

Soft wooded trees. Leaves alternate, usually broad; petioles usually exceeding the length of the blade; stipules narrow, membranous, early caducous. Flowers dicœcious, in lax catkins, often pedicellate in both sexes; bracts obovate, crenate, lobed or cut, caducous. Disk cup-shaped, oblique, membranous or thick and slightly fleshy. Male fl.: Stamens 4-30, inserted on the disk; filaments usually twice as long as the anthers; anthers large. Female fl.: Ovary sessile within the disk; placentas 3-4; ovules numerous on the placentas; stigmas 2-4, often lobed. Capsule 2-4-valved; valves spreading each with a median placenta; seeds minute with a long dense coma.

P. euphratica, Oliv. Voy. 3, Atlas, 449, t. 45 & t. 46; Fl. Br. I. 5,638; Brandis For. Fl. 474; Gamble Ind. Timb. 691; Cooke Fl. Pres. Bomb. 2,663. *Bân or bahan,* Vern.

A moderate-sized usually gregarious, deciduous tree; extremities sometimes hoary; buds slightly pubescent, not viscid. Leaves very variable in shape those of seedlings and coppice shoots linear, shortly petiolate and usually entire, 3″-6″ long, those of mature or older trees orbicular ovate, 1·5″-3″ long and as broad or often broader, dentate or more or less deeply cut or lobed, rounded, cordate or cuneate and 3-5-nerved at the base, coriaceous, glabrous; petioles long, slender. Flowers pedicellate in glabrous, lax, nodding catkins. Male fl. with large, oblanceolate bracts; pedicels slender, ·12″ long. Disk membranous, suborbicular, usually irregularly 8-toothed. Stamens 8-12; filaments filiform; anthers oblong, quadrangular, longer than the filaments. Female fl.: Disk membranous, caducous with 8-12 linear segments. Stigmas 2-3, irregularly crescent-shaped, narrowed into short styles. Capsule ovoid-lanceolate, ·2″-·5″ long, 2-3-valved; pedicels shorter than the capsules; seeds ellipsoid, surrounded by a mass of silky hairs.

India (Punjab and Sind), Western Tibet, Afghanistan, Beluchistan, Westwards to Syria and Egypt; Common in Sind along the Indus. Fl. Feb. when it is nearly leafless. Seeds ripe Apl.-June.

A large tree. 40′-50′ high and 2′-3′ in diameter, of rapid growth 3-4 rings per inch of radius. Bark thick with irregular, vertical furrows; inner-bark fibrous. Wood moderately-hard; sapwood white; heartwood reddish often almost black near the centre, compact, even-grained, tough but not durable. Annual-rings marked by a belt of tissue with fewer pores. Pores small, numerous, often subdivided, uniformly distributed. Medullary rays very fine, uniform, equidistant. Weighs about 35 lbs. to the cub. ft. The wood is used in Sind for building purposes, planking, lacquered-boxes, turnery and for boat building on the Euphrates, but not for fuel by the Indus river steamers as its heating power is rather low. *Bahan* poplar-wood is however generally used as fuel for domestic purposes. The leaves serve as fodder for cattle and goats. Gun-match is made from the inner-bark and the bark is given as a vermifuge. The reproduction of this tree is, as stated by Brandis, almost entirely from self-sown seed brought down during the river floods. It forms in the inundated areas a standard growth over the Tamarisk underwood. Where the tree is subject to inundation the lower part of the trunk often gets covered with short, horn-like roots, similar to those seen in willows and from the wood of the trunk short, hard, spine-like processes are found projecting in to the inner part of the bark as in ulmus. *Bahan* coppices freely and produces root suckers abundantly, often at a great distance from the parent stems; it also stands pollarding for a long time.

Order LXXXVI.—GNETACEÆ.

Trees or shrubs sometimes climbing; branches jointed at the nodes. Leaves opposite, broad or minute, scale-like. Flowers monœcious or diœcious, in axillary or terminal, bracteate spikes or cones. Male fl.: Perianth valvately 2-lobed or spathaceous. Anthers 2-8, subglobose, 1-3-celled, sessile or on a column formed of the connate filaments. Female fl.: An erect, naked ovule terminating above in a long tubular prolongation of its coat resembling a style and enclosed in an undivided bag or perianth. Seed dry or drupaceous; albumen copious or scanty; embryo straight; cotyledons adpressed; radicle long, superior.

Shrubs leafless or nearly so ...	...	...	...	1.	Ephedra.
Shrubs with broad, green leaves	...	...	...	2.	Gnetum.

1. EPHEDRA, Linn.

Erect or subscandent shrubs or undershrubs; branches jointed at the nodes and terete, opposite or whorled, old stems often ribbed. Leaves reduced to membranous sheaths at the nodes, often with leafy lobes. Flowers usually diœcious; males in sessile or pedunculate, opposite, paired or whorled, bracteate spikelets; females usually in pairs sometimes 3 or solitary. Male fl.: Perianth of 2, opposite, compressed, membranous sepals. Anthers sessile or stipitate, 2-8 on a central column; cells 2, opening by a short slit at the apex. Female fl. consisting of 1 ovule with a single integument prolonged into a tube with the functions of a style *(tubillus)* and enclosed in a bag or perianth, each inflorescence with several pairs of decussate, basal bracts. Fruit (in the Indian species) fleshy, consisting of several succulent bracts enclosing 1-2 seeds.

E. foliata, Boiss. Fl. Orient. 5, 716; Fl. Br. I. 5, 641; Cooke Fl. Pres. Bomb. 2, 665; Brandis Ind. Trees 686; *E. pedunculariș*, Boiss. Fl. Orient. 5, 717; Talb. Trees Bomb. ed. 2, 337; *E. Alte*, Brandis For. Fl. 501, t. 69. *Kuchan*, Vern.

A tall scandent shrub often gregarious; branches slender, flaccid, usually whorled; branchlets smooth, striate, often filiform, dark-green or glaucescent; internodes 1″-4″ long. Leaves 2-3-4, shortly connate at the base, linear, setaceous, about 1″ long. Male fl. in tetragonal, ovate obtuse, sessile, lateral or terminal, often whorled and clustered spikelets. Anthers 2-5, sessile. Female fl. in few-flowered, pedunculate, nodding cymes usually in pairs with 3 pairs of bracts. Tubillus truncate or bilobed, straight, short, exserted from the obtusely trigonous

integument. Fruit ovoid, ·25″ in diameter, succulent, red or milky-white when ripe, semitransparent with the 2 seeds visible.

Plains of Sind, Salt Range up to 3000,′ Punjab and Rajputana, Afghanistan, Arabia, Aden, Sinai. Often gregarious forming dense clumps of low brushwood on the barren desert. Fl. Mch.-Apl. (sometimes in Oct.) Fr. ripe May. Bark brown, exfoliating in fibrous threads. Stems 3″ in diameter, sometimes scandent.

2. GNETUM, Linn.

Evergreen climbing shrubs (one erect tree) with jointed branches. Leaves opposite, petiolate, penninerved. Flowers monœcious or dicœcious, whorled in the axils of cup-shaped bracts mixed with articulate hairs, in axillary, terminal, solitary or paniculate spikes. Male fl. monandrous, protruding from a thick, fleshy, clavate, more or less bifid sheath; anther-cells 2, opening by terminal

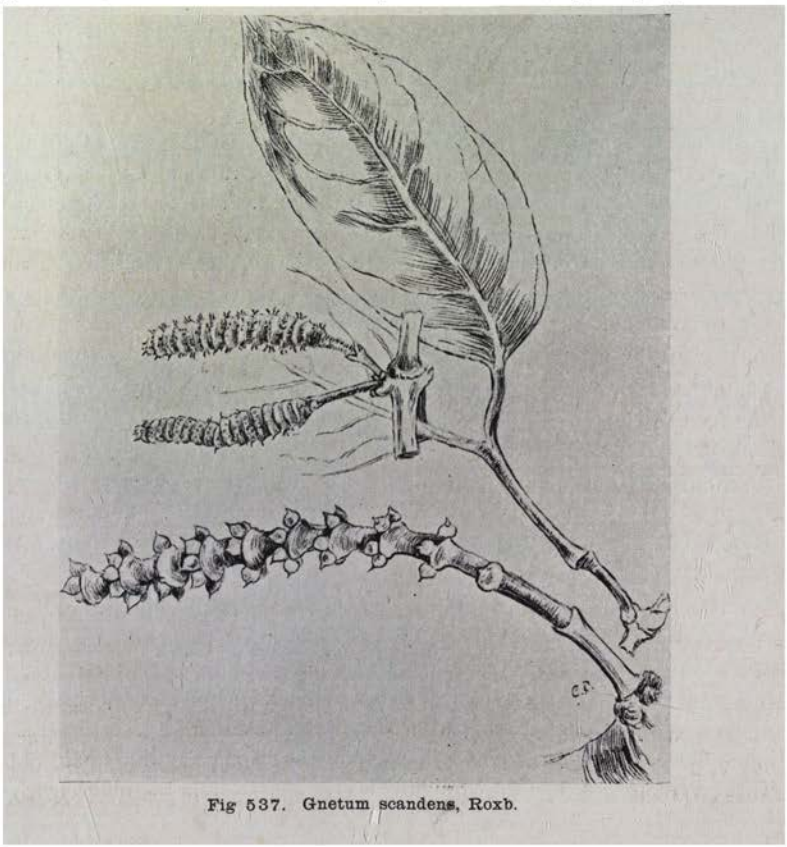

Fig 537. Gnetum scandens, Roxb.

slits. Female fl. solitary, ovoid or globose; the inner integument produced into a slender tube with a toothed or fimbriate mouth, performing the functions of a style and enclosed in inner and outer perianth-like bags. Fruit drupaceous consisting of the fleshy perianths enclosing a hard seed.

G. scandens, Roxb. Fl. Ind. 3, 518; Fl. Br. I. 5, 642; Brandis For. Fl. 502; Dalz. & Gibs. Bomb. Fl. 246; Cooke Fl. Pres. Bomb. 2, 665; Gamble Ind. Timb. 694. *Kumbal*, *umbli*, Vern. *Kodkan-balli*, K.

A stout climbing shrub; young shoots jointed and swollen at the insertion of the leaves. Leaves elliptic-oblong, 4·5″-6″ by 2″-3″, obtusely acuminate at the apex, acute, sometimes unequal-sided at the base, coriaceous, glabrous, turning black in drying; lateral-nerves 6-8 pairs, slender; petioles ·25″-·5″ long. Flowers monœcious, in stiff paniculate, verticellate spikes with numerous, short, annular sheaths in which the flowers are closely packed and mixed with articulate hairs; bracts of the male flowers closely imbricate, those of the female interrupted. Male fl. monandrous; anther-cells 2, distinct. Fruiting spikes 3″-10″ long. Stigma trifid. Fruit an oblong, 1-seeded drupe, 1″-1·5″ long, narrowed at the base into a thick, short stalk, red when ripe.

Tropical Himalaya from Sikkim eastwards to Assam and southwards to Singapore, Andamans, Western peninsula; common throughout the moist monsoon and rain-forests of the Konkan and N. Kanara. Fl. Jan.-Apl. Fr. ripe R. S. Stems 8″ in diameter at the base. Bark thick, brown, rough, scaly; inner-bark of interrupted rings of brownish-yellow, fibrous tissue. Wood of very abnormal structure, consisting of many narrow, soft, yellowish patches of cellular, open xylem containing numerous very large to small pores and separated by rings of bast tissue. Groups of these patches form rings of growth about ·5″ broad. Weighs about 40 lbs. to the cub. ft. The fruit is said to be edible also the seeds. A very interesting plant.

Order LXXXVII.—LILIACEÆ.

Perennial herbs with a creeping rootstock or rarely climbing shrubs or small trees. Leaves various, usually bisexual, axillary or terminal, spikate or paniculate; bracts small, scarious, sometimes spathiform. Perianth usually 6-merous in 2 series, imbricate in bud. Stamens 6, hypogynous or adnate to the perianth; filaments free or connate; anthers usually dorsifixed, dehiscing longitudinally. Ovary 3-celled; ovule 1, rarely 2 or more in the inner angle of the cells, anatropous, rarely orthotropous; style usually simple. Fruit a capsule or berry, usually 3-celled. Seeds 1 or more, globose or flattened; albumen horny or fleshy; embryo small, terete.

Climbing shrubs with broad persistent 3-7 basal-nerved leaves ... ... 1. Smilax.

Climbing shrubs with the leaves replaced by linear, caducous cladodes ... ... 2. Asparagus.

1. SMILAX.

Climbing shrubs with slender stems from a creeping rootstock. Leaves alternate, rarely opposite, persistent, 3-7 basal-nerved; petiole sheathing at the base with 2 cirrhiferous tendrils. Flowers small, umbellate, dicœcious. Perianth segments 6, free. Male fl.: Stamens 6, inserted at the base of the perianth; anthers didymous, oblong or the cells separate by the forking of the filaments. Pistillode small or O. Female fl.: Staminodes 3-6. Ovary trigonous, 3-celled; cells 1-3-ovuled; style short or O; stigmas 3, recurved. Berry globose. Seeds usually 2, hemispheric.

S. macrophylla, Roxb. Hort. Beng. 72; Fl. Br. I. 6, 310; Cooke Fl. Pres. Bomb. 2, 768; Grah. Cat. Bomb. Pl. 219; Dalz. & Gibs. Bomb. Fl. 246; *S. ovalifolia*, Roxb. Fl. Ind. 3, 794; Dalz. & Gibs. Bomb. Fl. 246; Grah. Cat. Bomb. Pl. 219. *Ghotvel*, M.

A large climbing shrub with slender stems armed with a few distant, small prickles or nearly unarmed. Leaves alternate, ovate to orbicular, 3″-8″ by 1·5″-4·5″, acuminate or cuspidate at the apex, rounded at the base, subcoriaceous, glabrous shining; basal-nerves usually 5, the centre one strongest; venation broadly reticulate, prominent; petioles ·5″-1″ long, narrowed into a sheath at the base with 2 long, slender tendrils. Flowers in many-flowered, peduncled umbels alternate on the zig-zag rachis; peduncles axillary, bracteate at the base, ·5″-1″ long; pedicels ·5″-·75″ long, minutely bracteolate at the base. Male fl.: Perianth

·25″-·5″ long; lobes linear, obtuse, erect when young, ultimately reflexed, the 3 outer broadest. Stamens exserted; anther-cells linear, divergent. Female fl.: Perianth shorter than the male; pedicels elongating, enlarged in fruit. Berry spherical, ·25″ in diameter, smooth, green, red when ripe.

Throughout India, Western peninsula, common in the Konkan and N. Kanara in monsoon and rain-forest. The size of the leaves is variable.

2. ASPARAGUS, Linn.

Unarmed or spinous climbing or rambling undershrubs with a stout, creeping rootstock. Leaves reduced to minute scales sometimes spinescent, with slender trigonous, flattened branches (cladodes) in their axils. Flowers small, white, hermaphrodite, axillary, solitary, fascicled or racemed, marcescent on jointed pedicels; bracts minute or obsolete. Perianth petaloid, 6-partite, campanulate or rotate. Stamens on the lobes; anthers dorsifixed, oblong. Ovary trigonous, 3-celled; cells 2 or more-ovuled; style short; stigmas 3. Fruit a globose berry. Seeds subglobose, few or solitary; testa black, fragile; embryo dorsal; albumen hard.

A. racemosus, Willd. Sp. Pl. 2, 152, Var. *javanica,* Baker in Jour. Linn. Soc. 24, 624; Fl. Br. I. 6, 316; Cooke Fl. Pres. Bomb. 2, 762; Gamble Ind. Timb. 724; *A. sarmentosus,* Grah. Cat. Bomb. Pl. 221 (not of Linn.); *Asparagopsis sarmentosa*, Dalz. & Gibs. Bomb. Fl. 246 (not of Kunth). *Satavari,* Vern.

A scandent much-branched spinous undershrub; branches angular; lower spines long. Leaves linear-subulate, ·1″-·25″ long with a stout, conical, spinous spur ·12″ long. Cladodes very slender, ·5″-1″ long, falcate, divaricate. Flowers white, fragrant, in solitary or fascicled, simple or branched racemes 2″-6″ long; pedicels filiform, ·2″ long, jointed above the middle, usually solitary with a small, acute bract at the base. Perianth-segments spreading, about ·12″ long; anthers minute, oblong, purple. Style very short; stigmas spreading. Fruit a small, globose, 1-2-seeded, red berry about ·15″ in diameter.

India, Subhimalayan tract up to 5000′, Ceylon, Java, Western peninsula; throughout the presidency both in dry deciduous thorn and moist monsoon-forest, common in the Deccan. Flowers in the C. S. when the thorny stems are without cladodes. "The oblong fleshy tubers are often candied for the table," Cooke.

There are several other slender-stemmed species indigenous in Sind or within the presidency limits. *A. asiaticus*, Linn. with very slender, acicular, terete, fascicled cladodes is common on the dry Kuput hills in the Dharwar district. *A. gonocladus*, Baker with long, slender, 2-6-nate, flat, falcate cladodes is fairly common in moist monsoon-forest in N. Kanara and the Konkan. *A. lævissimus,* Steud. and *A. ȝacquemonti* are very rare species on the Konkan ghàts whilst *A. dumosus*, Baker is confined to Sind.

Order LXXXVIII.—PALMÆ.

Trees or shrubs erect or climbing sometimes gregarious; stems solid, simple or branched. Leaves pinnately or palmately divided; segments linear or lanceolate those of the palmatisect leaves frequently bifid those of the pinnatisect leaves entire or irregularly lobed; petioles usually with a broad sheathing base, sometimes spinous. Flowers small, frequently yellow or greenish-yellow, hermaphrodite, unisexual or polygamous, in terminal or axillary, simple or panicled spikes, usually 3-bracteolate; inflorescence usually enclosed when young in more than one spathe. Perianth inferior of 6 segments, 2-seriate, that of the female often persistent in fruit. Stamens 6, rarely 3 or more; anthers versatile. Ovary 3-celled or of 3, 1-celled carpels; ovules 1-2, variously attached in each cell or carpel, anatropous; stigmas 3, usually sessile and undivided. Fruit a 1-3-celled drupe or berry or of 3 distinct drupes or berries often 1-2 aborted; pericarp smooth, rough or retrorsely scaled. Seeds various; albumen ruminate or even, solid or hollow; embryo small in a cavity near the surface of the albumen.

A very important Order of economic and ornamental plants. Few of the species are however of great importance in forest economy.

Leaves pinnate or pinnatisect.
  Leaves simply pinnate; leaflets acute.
    Erect unarmed trees or shrubs. Fruit smooth without a covering of retrorse closely appressed scales.
      Leaflets linear without a midrib; venation induplicate ... ... 1. Phœnix.
      Leaflets linear or lanceolate with a midrib; vernation reduplicate.
        Spadix androgynous, inserted below the leaves.
          Male flowers minute at top of the ascending spadix-branches; female at the base.
            Stamens 3-6. Spathes 3 or more, upper bracteiform ... ... 2. Areca.
          Male flowers, one on each side of a female along the spadix-branches.
            Stamens numerous. Spathe solitary ... 3. Pinanga.
          Male flowers in pairs at the top of the spadix-branches; lower flowers, one female between two males. Stamens numerous.
            Spathes 2 ... ... 4. Actinorhytis.

Spadix axillary amongst the leaves.
Spadix unisexual. Leaflets præmorse, auricled.
Stamens numerous ... ... 5. Arenga.
Spadix androgynous. Leaflets acute.
Stamens 6 ... ... 6. Cocos.
Climbing, armed shrubs. Fruit covered with retrorse closely appressed scales ... ... 7. Calamus.
Leaves decompound; leaflets rhomboid or cuneate, præmorse ... ... 8. Caryota.
Leaves flabelliform.
Spadix axillary amongst the leaves.
Petioles unarmed. Flowers polyganous. Fruit a small, globose, 1-seeded drupe ... ... 9. Nannorhops.
Petioles with spinescent serratures. Fruit a large, subglobose drupe with 1-3 compressed pyrenes 10. Borassus.
Spadix terminal, immense. A monocarpous tree .... 11. Corypha.

1. PHŒNIX, Linn.

Low shrubs or palms with short or tall stems covered with the bases of the woody petioles or rarely annulate. Leaves pinnate; leaflets entire, linear, rigid, folded longitudinally and obliquely attached by the longitudinal parallel, laterally folded bases to the compressed, angular petiole, lowest leaflets transformed into long, vulnerant, yellow spines; nerves longitudinal, parallel, midrib O; petioles terete or flat with a fibrous, reticulate, amplexicaul sheath. Flowers small, monœcious or diœcious, sessile, coriaceous, yellow, on branched, interfoliar, erect or drooping spadices; spathe basilar, complete, coriaceous. Male fl.: Calyx cupular, 3-toothed. Petals 3, obliquely ovate, valvate. Stamens 6 or 3, rarely 9. Pistillode minute or O. Female fl.: Calyx of the male, accrescent. Petals 3, rounded, imbricate, Staminodes 6 or connate into a 6-lobed cup. Carpels 3, free; ovules solitary in each carpel, erect; stigmas sessile, hooked. Fruit a one seeded, ovoid or oblong, fleshy drupe with a membranous endocarp. Seed ventrally grooved; albumen horny or sub-ruminate; embryo dorsal or subbasilar.

Stems long, up to 50′.
Fruit orange-yellow. Stems 30′-50′ long ... ... 1. P. sylvestris.
Fruit black. Stems 15′-20′ long ... ... 2. P. robusta.
Stems short up to 10′ long or stemless. Fruit black.. 3. P. humilis, var. pedunculata.

1. P. sylvestris, Roxb. Fl. Ind. 3, 787; Fl. Br. I. 6, 425; Dalz. & Gibs. Bomb. Fl. 278; Brandis For. Fl. 554; Cooke Fl. Pres. Bomb. 2, 801; Gamble Ind. Timb. 731. *The Wild Date Palm. Boichand, shindi, sendri.* M. *Kharak,* Guz. *Ichil,* K. *Khajur.* Vern.

A moderate-sized tree; stems densely covered with the prominent woody bases of the fallen leaves. Leaves glaucous-green, 7'-12' long, glabrous; leaflets rigid, 6"-18" by ·25", alternate, opposite or fascicled; petioles short, compressed towards the apex, spinous at the base. Male fl. white, angled, ·25" long, scented. Spadix 2'-3' long, erect, with slender branches; peduncles compressed. Spathes 12"-16" long, separating into 2, thick, boat-shaped valves. Petals 3-4 times as long as the calyx, warted on the outside. Filaments very short, free; anthers shorter than the petals. Female fl. distant, roundish. Spadix and spathe as in the male. Calyx cup-shaped, 3-toothed. Petals 3, broad, convolutely imbricate. Staminodes 3-4. Fruiting peduncles 2'-2·5' long and 1"-1·5" broad, golden-orange colour. Fruit oblong, 1" long, rounded at the ends, orange-yellow, edible; seeds rounded at both ends about ·6" long, grooved on one face, pale-brown.

Tropical India, wild in many districts, often cultivated; throughout the presidency in the dry districts usually along the banks and in the beds of streams and dry watercourses often gregarious and certainly indigenous, absent from Sind and the Punjab where it is replaced by *P. dactylifera.* A conspicuous and well known tree which sometimes when untapped reaches a height of 50' with a diameter of 8". Stems densely covered with the bases of the fallen petioles or marked with prominent scars when these have fallen. Wood light-brown, outer hard, rough and very fibrous, inner soft. Fibro-vascular bundles large, the horny part pale shining, round or oval with 3-5 pores on the inner border. The chief product of this palm is the sugary juice which is extracted during the cold season by means of deep notches and subsequent superficial wounds made in the upper parts of the stem below the lowest living leaves. The sap is boiled down into sugar. The stems are sometimes used for water-pipes or for building purposes and the leaves are made into ropes, baskets and mats.

2. P. robusta, Hook, f; Fl. Br. I. 6, 427; Cooke Fl. Pres. Bomb. 2, 801; *Phœnix sp.* Brandis Ind. Trees. 645. *Shelu,* M.

A moderate-sized tree; stems 15'-20' high and 12"-15" in diameter, clothed with the persistent spirally arranged, small bases of the fallen petioles which when smooth gives some of them the appearance of a *Cycas* trunk. Leaves 3'-5' long, greyish-green; leaflets linear, 12"-16" by ·3"-1" finely acute and shortly split at the apex, strongly conduplicate on the flattened rachis, thin, glabrous, shining and half as broad as the leaflet at the base in the upper part of the leaf; petioles about 6" long, armed with slender, grooved, vulnerant, yellow spines (transformed leaflets) above the tubular, red, matted sheaths which

enclose the terminal bud. Flowers monœcious. Spadix compressed ovoid; branches slender, flexuous, ascending, very numerous. Spathes thinly coriaceous, pale-yellow, 8″-12″ long by 2·5″-3″ broad, narrowed and flattened at the apex and base; margins keeled, fringed with detachable, brown, curled hairs in the lower part. Male fl. alternate, solitary, ·15″ long, pale-yellow. Calyx triangular cup-shaped, truncate and 3-toothed. Petals 3-4 times as long as the calyx, ovate, concave, thick, smooth and longitudinally striate. Filaments very short. Female fl.: Spadix and spathe of the male. Fruiting peduncle 2′-4′ long, smooth, yellow, rounded, compressed; branches 6″-8″ long, fascicled or whorled at the end of the peduncle, slender, acutely 4-angled, straight in the lower half, flexuous in the upper. Fruit sessile, ovoid cylindrical, ·75″ long by ·3″ thick, flattened and apiculate at the top, smooth, fleshy, black when ripe, sweet, edible; seed ·3″ long, deeply grooved.

Western peninsula on trap, Poona and Nasik ghâts near Nandgaon, Bhimashunkur and Sakarpathar, gregarious near Bhorkas; Parasnath in Behar. Fl. C. S. Fr. ripe early in the R. S.

This palm which is fairly common along the Poona ghâts near Khandala, Bhimashunkur and elsewhere on trap is considered by Dr. Cooke identical with *P. robusta*, Hook, f. from Parasnath in Behar. Sir D. Brandis however refers it simply to *Phoenix sp.* in his Indian Trees. The flowers and fruit are identical with those of *P. humilis*. The principal differences are in the size and length of the stems and size of the fruiting spadices which are somewhat variable characters. Perhaps it may eventually be better to consider both as varieties of the same species. The leaves are made into mats in the Poona district.

3. P. humilis, Royle Illustr. 394. Var. *pedunculata,* Becc. Males. 3, 379; Fl. Br. I. 6, 426; Cooke Fl. Pres. Bomb. 2, 802; Gamble Ind. Timb. 730; (*P. pedunculata, sp.*); Griff. Palms. Brit. E. Ind. 139; *P. acaulis,* Dalz. & Gibs. Bomb. Fl. 278. *The Dwarf Date Palm. Shewra, shilind,* M. *Sun-ichil,* K.

An erect, soboliferous palm; stems very short up to 10′ high by 8″-9″ in diameter, densely covered with the bases of the fallen petioles, sometimes nearly smooth with a tesselated appearance or with the traces of the petioles completely removed. Leaves as in *P. robusta.* The matted reddish brown fibrous tissue at the bases of the petioles and peduncles form concentric tubes 6″-8″ long, surrounding the terminal bud which is very effectively protected by the vulnerant, yellow, slender, often twisted spines at the bases of the petioles. Flowers sweet-scented, monœcious as in *P. robusta*; Spathes 6″-8″ long, thinly coriaceous, glabrous; keeled and with the margins fringed when young. Fruiting spadix very variable in length, 6″ up to 3′; peduncle flattened on one side, convex on the other, about ·5″ broad, smooth, yellow. Fruit black, succulent, edible as in *P. robusta*; seed with a wide sinus.

Hilly districts of India from Kumaon eastwards to Burmah and southwards to Malabar, Assam, Khasia Hills, Eastern Bengal, Chota Nagpore, Orissa and the Circars, Western peninsula, Nilgiris; throughout the presidency in dry stituations often on laterite, gregarious in part of the Kanara, Belgaum and Dharwar districts. Fl. C. S. Fr. ripe end of May-June.

Differs from *P. robusta* merely in the height and thickness of the stems, variable characters. Specimens of this palm from the N. Kanara district were referred to *P. robusta*, by Prof. Beccari (Gamble Ind. Timb. 730, l. c.). The *P. acaulis* of Dalz. & Gibs. is apparently the stemless form of this widely spread, common palm. Wood light-red, very rough and fibrous. Fibro-vascular bundles small, oval, horny, the inner rounded half of white tissue with a group of 2-5 minute pores. The leaflets are made into mats which serve in the Dharwar district as covering for the large red-pepper bales.

2. ARECA, LINN.

Stems simple annulate. Leaves pinnatisect, unarmed; leaflets reduplicate, plicate. Spathes 3 or more, caducous. Spadix androgynous, infrafoliar, branched, lax, pendant. Male fl. many, minute. Sepals 3. Petals 3, obliquely lanceolate, valvate. Stamens 3-6; filaments short; anthers linear, erect, basifixed. Female fl. much larger than the male, few at the base of the branches. Perianth accrescent. Sepals 3, imbricate. Petals 3, imbricate, with acute, valvate tips. Ovary 1-celled; ovule erect, basilar; stigmas 3, sessile. Fruit ovoid or oblong with the stigmas terminal. Seed sub-hemispheric, truncate at the base; albumen ruminate; embryo basilar.

A. Catechu, Linn. Sp. Pl. 1189; Fl. Br. I. 6, 405; Brandis For. Fl. 552; Dalz. & Gibs. Bomb. Fl. Suppl. 95; Gamble Ind. Timb. 726; Griff. Palms of Brit. Ind. 47; Cooke Fl. Pres. Bomb. 2, 809. *The Supari* or *Betel-nut Palm. Pung,* M. *Adiki,* K.

A graceful slender-stemmed palm; trunk 40′-80′ high by 8″-16″ in diameter of equal thickness throughout, smooth, grey, annulate with raised not quite horizontal rings which are alternately inclined to opposite sides. Leaves pinnate, 4′-6′ long, glabrous; leaflets linear to linear-lanceolate 1′-2′ long, lowest finely acuminate, upper præmorse or bifid, uppermost confluent, many-veined; sheath long, smooth. Spathes simple, compressed, glabrous; lowest large, straw-coloured, parallel-veined. Spadix androgynous, shortly peduncled, 12″-19″ long, much-branched, with a stout, compressed rachis; branches filiform, terminating in pendulous male spikes. Male fl. small, more or less distichous. Sepals 3, minute, triangular. Petals much larger, oblong, rigid, striate. Stamens with short, triangular filaments and sagittate anthers. Pistillode 3-fid. Female fl.

much larger than the male, 1-3 at the base of the spadix-branches or in their axils. Sepals ovate, cordate, ·3″ long, obtuse. Petals similar to the sepals but slightly longer. Staminodes forming a 6-toothed membrane. Fruit fleshy-fibrous, ovoid, 1·25″-2″ long, orange or scarlet; seed ovoidly hemispheric in the upper part of the fruit, about ·75″ in diameter.

A native of Cochin China, cultivated in the tropical regions of Asia and in the islands of the Malay Archipelago; throughout the presidency but nowhere so extensively cultivated as in the Southern talukas of N. Kanara (Sircy and Siddapore) where the *Betel-nut* plantations are very numerous and extensive. As from 4 to 8 acres of forest are alloted to each acre of plantation for the supply of leaf manure, a considerable proportion of the wooded area of this part of N. Kanara is in progress of gradual denudation. Fl. R. S. Fr. C. S. Stems grey, smooth, shining, the inner part generally hollow. Wood brownish-grey. Vascular bundles large, brown, forming a compact rind on the outer part of the stem, each bundle with a heart-shaped, horny part and one pore in the sinus. Weighs about 57 lbs.to the cub. ft. Wood used for a variety of purposes, walking-sticks, scaf-folding-poles, water-channels, spear-handles, etc. The leaf-sheaths serve for writing materials and are also made into hats stitched with kittul fibre which are worn by some castes of Hindus on the Malabar coast. The seeds are turned and strung into neck-laces. The principal use of the seeds is however for chewing with lime and *Piper Betel* leaves.

3. PINANGA, Blume.

Unarmed erect slender annulate-stemmed palms. Leaves pinnatisect with the upper leaflets confluent. Spadix from the axils of fallen leaves, androgynous; flowers 3 together, a female between two males. Spathe solitary. Male fl. triquetrous. Sepals acute, keeled, not imbricate. Petals ovate, valvate. Stamens 6 or more; anthers subsessile, basifixed, erect. Female fl. much smaller than the male, ovoid, globose. Sepals and petals orbicular, broadly imbricate. Ovary 1-celled; ovule basal, erect. Fruit ovoid or ellipsoid with a fibrous pericarp. Seed ovoid or ellipsoid; albumen ruminate; embryo basilar.

P. Dicksonii, Blume Rumph. 2, 85; Fl. Br. I. 6, 409; Cooke Fl. Pres. Bomb. 2, 803; *Areca Dicksonii,* Roxb. Fl. Ind. 3, 616; Griff. Palms of Brit. Ind. 153, t, 231.

A slender erect, green, smooth, annulate-stemmed, soboliferous palm 16′-20′ high by 1″-1·25″ in diameter. Leaves 4′ long; sheath thick, coriaceous, about 14″ long, truncate at the top; leaflets numerous, sessile, elongate, broadly linear, 12″-24″ by ·75″-1″, præmorse, the upper confluent; nerves 5-7. Spadix 8″-12″ long, by 2″ broad and 1″ thick, lanceolate-ovoid, refracted, with 4-8 stout branches,

densely clothed with the imbricating flowers. Spathe simple, rigid, compressed, margined at the top. Male fl.: Sepals subulate. Petals larger than the sepals. Stamens numerous (20-30); filaments short. Pistillode O. Female fl. red within the spathe. Sepals and petals reniform, acute, similar. Fruiting spadix short, flattened, stout, decurved; branches 4-8, 8"-10" long, flattened, straight. Fruit ellipsoid, ·5" long by ·3" thick, broad and slightly contracted at the base, seated on the perianth in 2 opposite rows at right angles to the spadix-branch on the flattened sides; epicarp smooth, fibrous; seed narrow, ellipsoid, about ·4" long with albumen ruminate.

Western peninsula from N. Kanara to the Nilgiris and Travancore hills up to 2500', N. Kanara near the Gairsoppah and Nilkund ghâts in rain-forest, gregarious and locally common. Flowers at different times throughout the year. A slender, graceful small, palm; stems slightly constricted at the nodes which are from 3"-9" long. Wood grey with dark loose fibrous tissue in the centre. Vascular bundles large, horny with a few pores on the inner margin. An ornamental palm worth introducing into gardens. The only use the stems are put to in N. Kanara is for making cages for road metal on the Gairsoppah ghât road near Mulamane.

4. ACTINORHYTIS, H. WENDL.

Stems stout, annulate, unarmed. Leaves pinnate. Spadix androgynous, shortly pedunculed, with flexuous branches. Spathes 2, caducous. Flowers small, two males one on either side of a female at the base of the spadix-branches, solitary or twin bracteate males above. Male fl. numerous, minute. Sepals 3, imbricate. Petals 3, valvate. Stamens numerous (24-30), fascicled; anthers linear, versatile. Female fl. much larger than the male. Perianth accrescent. Ovary 1-celled; ovule solitary, pendulous. Fruit large, ellipsoid; pericarp fleshy, fibrous; endocarp crustaceous; albumen ruminate.

A. calapparia, H. Wendl. & Drude in Linnæa, 39, 184; Cooke Fl. Pres. Bomb. 2, 809; *Areca calapparia,* Blume. Rumph. 2, t. 100, fig. 2; *A. cocoides,* Griff. in Calc. Jour. Nat. Hist. 5, 454 & Palms Brit. Ind. 150. t. 230 B. *Ram-supari,* Vern.

A tall palm with grey, smooth cylindrical stems 40'-60' high by 12" in diameter. Leaves pinnate, 8'-9' long by 4·5' broad, lanceolate in outline; leaflets linear, 24" long by 1·5" broad, acuminate and unequally bipartite at the apex, uppermost confluent and subpræmorse. Spadix infrafoliar, ascending, green; branches stiff, stout, flexuous in the upper part. Spathes 2, Male fl. small. Sepals hard, keeled, much smaller than the petals, imbricate, with the margins sub-membranous, denticulate. Petals oblong-lanceolate, subobtuse. Stamens

numerous. Pistillode O. Female fl.: Sepals and petals similar, imbricate with broad bases. Staminodes O. Ovary large, oblong, sub-compressed; ovule solitary; stigma 3-lobed; lobes cuneate, recurved. Fruiting-spadix spreading, annulate at the base; branches stout, angular, thickened at the base. Fruit pendulous, ellipsoid, size of a large hen's egg, orange.

Indigenous in the islands of the Malay Archipelago, sparingly planted throughout N. Kanara in the *Supari* gardens. Fl. C. S. The fruit is used medicinally by the Haigas in N. Kanara. A very distinct species, somewhat resembles the *Cocoa-nut* Tree in general appearance.

5. ARENGA, LABILL.

Tall stout or nearly stemless palms; stems simple, erect, covered with the remains of the fibrous leaf-sheaths in the upper part. Leaves terminal, long, pinnatisect, white beneath; leaflets præmorse at the apex, 1-2-auricled at the base with a midrib and numerous longitudinal nerves. Spadix interfoliar in the axils of the green leaves, large panicled; branches pendulous; peduncles short, decurved; male and female flowers usually solitary and in separate spadices. Spathes many, basilar. Male fl. symmetric. Sepals 3, orbicular, imbricate in bud. Petals 3, oblong. Stamens indefinite; filaments short; anthers apiculate. Pistillode O. Female fl. subglobose. Perianth accrescent. Sepals cordate. Petals triangular. Staminodes many or O. Ovary 3-celled; cells each with one ovule. Fruit obovoid, 2-3-seeded; stigmas terminal. Seeds compressed or plano-convex, albumen uniform; embryo dorsal.

A. Wightii, Griff. in Calc. Jour. Nat. Hist. 5, 475; Palms Brit. Ind. 167, t. 235 E; Fl. Br. I. 6, 422; Cooke Fl. Pres. Bomb. 2, 804; Gamble Ind. Timb. 728. *Dadsel,* K.

A short, thick-stemmed palm; stems 3′-10′ high and 12″-24″ in diameter, densely clothed with the fibrous bases of the leaf-sheaths, soboliferous. Leaves 12′-30′ long, including the furfuraceous petiole which is 4′ long by 1″ thick at the base; leaflets alternate, crowded, linear, ensiform, 3′-3·5′ by 1·5″-2,″ distantly toothed in the upper part, irregularly toothed or præmorse at the apex, coriaceous, white beneath, 2-auricled at the base; auricles unequal, lower very large; nerves 4-5 on either side of the prominent scaly midrib; upper leaflets confluent. Spadix, 4′-5′ long, decurved, pendulous, with numerous, drooping branches about 1′-2′ long; peduncles ascending about 2′ long and 1″ thick at the base in the male, much thicker in the female, concealed by the imbricate spathes. Spathes 3-7, acute or lacerate. Male fl. strongly scented, ovoid in bud, ·5″ long, spirally arranged in pairs on the pendulous branches with a vertical scale between the flowers. Sepals orbicular, thick, and imbricate at the base. Petals ovate-acute, 3-4

times as long as the sepals, valvate very thick, striate, furfuraceous. Stamens numerous; anthers linear, basifixed, subacute, as long as or longer than the filaments. Female fl. seated in a bilobed cup, solitary, spirally arranged on the branches which are attenuate towards the ends and bearing rudimentary flowers. Sepals small, cordate. Petals much larger than the sepals, orbicular cordate, acute or cuspidate. Staminodes several. Ovary subglobose, 3-celled; ovule solitary in each cell; stigmas 3, short, recurved. Fruit globosely turbinate, obtusely triangular, size of a small crab apple, depressed, crowned with the remains of the stigma, seated on the thick corolla and small calyx; seeds 3·75″ long, brown, convex on one face, unequally angular on the other. Episperm smooth; albumen white horny, equable.

Western peninsula, N. Kanara, common on the Mushki ghât at about 1500′ in moist monsoon-forest, gregarious but very local, very common in rainforest near the Falls of Gairsoppah, Coimbatore, Nilgiris up to 3000′, Fl. C. S. Fr. R. & C. S. An ornamental species worth introducing into garden cultivation.

6. COCOS, LINN.

Tall palms with annulate stems. Leaves pinnate; petioles amplexicaul with a fibrous base. Spadix androgynous, 4′-6′ long, paniculate. Spathes 1-2, boat-shaped, woody. Flowers sessile, bracteate, male numerous at the ends of the branches, scattered, female often between two males below. Male fl. unsymmetric. Sepals 3, small, valvate. Petals oblong, ·25″ long, acute, valvate. Stamens 6; anthers erect. Pistillode minute or O. Female fl. larger than the male, ovoid, 1″ long, 2-bracteate at the base. Sepals 3, imbricate. Sepals 1″ in diameter, round, concave, imbricate. Petals shorter than the sepals with round, convolute tips. Ovary 3-celled; Staminodes 6. Fruit large, ovoid, trigonous, 8″-12″ long, 1-seeded; mesocarp woody, fibrous; endocarp bony with 3 basal pores indicating the 3 ovarian cells; albumen fleshy, oily, lining the endocarp with a large cavity filled with a sweetish fluid known as Cocoa-nut milk; embryo cylindric, opposite one of the pores.

C. nucifera, Linn. Sp. Pl. 1188; Fl. Br. I. 6, 482; Grah. Cat. Bomb. Pl. 225; Dalz. & Gibs. Bomb. Fl. 279; Brandis For. Fl. 556; Cooke Fl. Pres. Bomb. 2, 812; Gamble Ind. Timb. 739; Watt Dict. Econ. Prod. 2, 415. *The Cocoa-nut Palm. Narel,* Vern. *Tengina,* K.

Trunk annulate 40′-80′ high, thickened at the base with a large rounded mass of rootlets. Leaves 6′-15′ long; leaflets distichous, linear-lanceolate, equidistant; petioles 3′-5′ long, very stout. Spadix erect, divided into numerous, short, thick branches. Fruit green or yellowish, smooth, shining.

Cultivated throughout the hot, damp regions of India, Burmah and Ceylon and generally in the tropics near the seacoast. Possibly indigenous in the Cocos Islands and N. Andamans but the original home and history of its gradual spread are insufficiently known. Fl. throughout the year. Fr. ripe 9-10 months after flowering. Wood red outside, reddish-brown within, close-grained, hard and heavy. Vascular bundles closely packed in the outer part of the stem, red, the horny part irregularly shaped and cordate with one or more large pores in the sinus. Weighs 70 lbs. to the cub. ft. Used for building purposes, walking sticks, spear-handles and generally for furniture and fancy work. The wood is known commercially as *Porcupine-wood.* The fibrous rind of the nuts yields the coir fibre used for ropes, nets, etc. The oil from the fruit is an important article of trade. The cut fruiting peduncles yield toddy which is fermented or made into sugar. The milk of the unripe fruit furnishes a pleasant cool drink in the tropics and the white kernels of the ripe fruit are eaten raw or cooked. For the many uses of the *Cocoa-nut Tree* see Watt's Dictionary of Economic Products.

7. CALAMUS, Linn.

Armed scandent rarely erect, tufted palms. Leaves alternate, pinnatisect; rachis often produced into an armed flagellum; sheath armed, produced into a ligula with or without an armed flagellum. Spadices axillary usually elongate and much branched sometimes produced into a flagellum. Spathes tubular or open, persistent, sheathing, the peduncle and spadix branches passing into bracts and bracteoles (spathels and spathellules). Flowers polygamo-dicœcious, solitary or binate within the bracteoles, arranged in distichous, usually scorpioid spikelets. Perianth coriaceous. Male fl.: Calyx cupular, 3-toothed. Petals 3, coriaceous, valvate. Stamens 6; filaments short; anthers dorsifixed. Female fl.: Calyx of the male. Corolla 3-fid, tubular below, valvate. Staminodes connate into a cup. Ovary incompletely 3-celled, covered with retrorse scales; ovules basilar, erect; style short or long; stigmas 3. Fruit globose or ellipsoid clothed with the appressed, retrorse, polished scales. Seed subglobose or oblong, flattened, smooth or pitted; albumen equable or ruminate; embryo ventral or basal.

Fruit globose; scales not channelled down the middle.
Male flowers globose in few-flowered groups or short scorpioid spikelets on the spadix-branch, glabrous... 1. C. pseudo-tenuis

Fruit ellipsoid; scales channelled down the middle.
Male flowers solitary, closely distichous on the flattened spadix-branch, furfuraceous ... ... 2. C. Thwaitesii.

1. **C. pseudo-tenuis,** Becc. ex Hook. f. Fl. Br. I. 6, 445; Cooke Fl. Pres. Bomb. 2, 806; Trimen Fl. Ceyl. 4, 330.

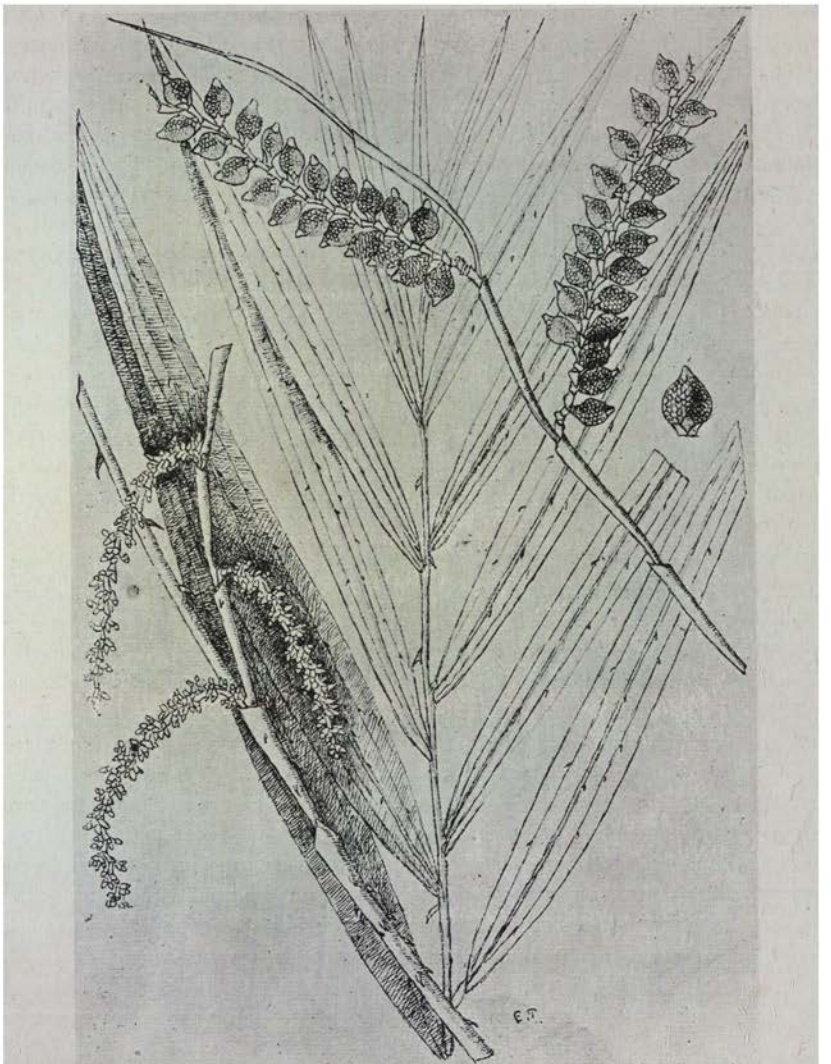

Fig 538. Calamus pseudo-tenuis, Becc.

Stems slender scandent climbing; sheaths set and completely covered with unequal, flattened, stiff, black, very sharp spines varying in length up to 1″. Leaves about 4′ long; petioles about 8″ long with a few solitary, stout, spreading spines; rachis without a flagellum, angular, grooved, with short, recurved, distant,

solitary, black or yellow, sharp spines and clothed more or less with brown scaly pubescence; flagella of the sheath and spadix very long, slender, compressed below and covered with half rings of black, short, deflexed, hooked spines with very thick bases; leaflets very numerous, equidistant, linear-lanceolate, 12″-16″ by ·6″-1·25″, 3-5 parallel-nerved and with long, black, distant, bristles (thickened at the base) on the nerves above and margins at or near the slender, acuminate apex, thin, with slender, interrupted cross veinules between the nerves. Spadix flagelliferous, 2′-3′ long, pinnately branched; branches more or less deflexed and curved, 2″-6″ long, distichous, lower longest; female usually longer than the male. Spathes flattened, long-tubular, armed with scattered, short, recurved spines, furfuraceous; spathels funnel-shaped, acuminate, acute. Male fl. minute, globose in bud, spirally arranged in short, 4-12-flowered, scorpioid spikelets on the lower branches, solitary and distichous on the upper. Calyx globose, black, striate, shortly 3-lobed; lobes triangular, valvate. Corolla twice as long as the calyx in the mature flowers, ovoid, pointed, pale-yellow, glossy; petals valvate. Filaments very short. Female fl. solitary, alternately distichously arranged on the branches, buds larger than the male. Calyx tubular-conical, broad at the base, yellowish, smooth, striate, minutely toothed at the top; stigmas exserted. Corolla included. Fruit globose about ·2″ in diameter with a straight, conical beak, crowned with the recurved stigmas; scales with a short, scarious, erose apex, yellowish with a brown margin or brown with a yellowish crescent at the apex or base of the scale; seeds black, irregularly globose, ·15″ in diameter, warted; albumen dark-brown, equable, very hard.

Western peninsula, Ceylon, fairly common on the N. Kanara ghâts in rain-forest. Fl. at different times throughout the year. The stems furnish the thin canes extensively used throughout the presidency for baskets, chair-work and other purposes.

2. **C. Thwaitesii,** Becc. ex Hook, f.; Fl. Br. I. 6, 441; Cooke Fl. Pres. Bomb. 2, 807; Trimen Fl. Ceyl. 4, 330. *Hundi-bet,* K.

Stems stout climbing, very long, up to and more than 100′ long by 1·5″ in diameter, enclosed in the leaf sheaths which are completely covered and set with flattened sharp, black, ensiform, deflexed spines of different lengths up to 2″, mixed with oblique lines of erect, narrow spines. Leaves about 5′ long; petioles 7″-12″ long, stout, channelled above, set with imperfect oblique rings of flat spines, without a flagellum; flagella of the sheath and spadix very long, slender compressed below and covered with half-rings of deflexed hooked, short, stout, black-tipped spines; rachis keeled above, more or less furfuraceous in the lower part and set beneath with distant half-rings of short, stout, black-tipped spines which are solitary in the upper part; leaflets numerous, equidistant or fascicled, 1′-2′ by ·75″-1·5,″ very acute or slender-acuminate at the apex, remotely and retrorsely spinulose on the midrib beneath, margins distantly setose, setæ

crowded at the apex of the leaflet; nerves 2 on either side of the midrib with 8-10 nervules between; cross-nervation distant, distinct. Spadix flagelliferous, long and slender, stouter in the female, pendulous; flagella slender, often trailing, armed with half whorls of black-tipped, short, hooked spines; spikes 6″-8″ long, drooping. Spathes very long, sheathing, acute or lacerate at the top, grooved and striate, furfuraceous, armed with short, irregular sometimes oblique whorls of slender, deflexed, straight, flattened, black spines of different lengths up to 1″; spathels imbricate, widened upwards, truncate, with a short triangular limb, armed with a few black, short, stout prickles near the top. Male fl. closely bifarious, distichous, ovoid, slightly curved, ·25″ long, seated in a very shallow, 3-lobed cup. Calyx tubular with 3 short, broad, hemispheric lobes, furfuraceous. Corolla 2-3 times longer that the calyx, shortly stipitate; lobes ovate, acute, valvate, brown-furfuraceous outside, shining, 4-ribbed within. Stamens 6, inserted at the top of the slender corolla stipes; filaments flattened, keeled, longer than the versatile, entire anthers which are exserted from between the corolla-lobes. Pistillode minute at the top of the corolla stipes. Female fl. glabrous, ovoid, obtusely triangular, very slightly curved, about ·2″ long, distichous, solitary or geminate with the upper flower at right angles to the slightly deflexed lower. Calyx ovoid, shortly and obtusely 3-lobed, glabrous, seated on a cup-shaped, triangular spathellule with crescent like sides and a keeled margin. Corolla without stipes; lobes longer than the calyx, ovate, acute, valvate. Staminodes erect; filaments short, connate into a shallow cup at the base; anthers versatile, sagittate at the base, bilobed at the apex. Ovary columnar, 4-angled, covered with minute scales; stigmas thick, united in a conical beak at the end of the ovary, afterwards recurved, spreading in the open flower. Fruit ellipsoid, strongly beaked, ·75″ long, seated on the enlarged perianth; scales yellowish with an entire, narrow, dark-brown margin,channelled down the middle, 4-5 scales in each vertical row; seeds compressed, ovoid, about ·5″ long; albumen equable, deeply foveolate, enclosed in a spongy or resinous episperm.

Western peninsula; sea coast near Marmagoa, growing on laterite; N. Kanara in moist monsoon-forest forming extensive cane brakes in the Yellapore and Supa talukas. The flattened, strap-like male spikes are characteristic. Male stems are common near the coast whereas the female are rare. The contrary is the case near Yellapore. Fl. & Fr. C. & H. S. I have doubtfully followed Beccari and Hooker in referring the N. Kanara plant to *C. Thwaitesii,* an erect species with undescribed female flowers.

8. CARYOTA, Linn.

Tall palms with annulate or sheathing stems flowering from the upper leaf-axils and successively downwards, the inflorescences alternately male and female;

the tree dies after the last spadix near the ground has flowered and seeded. Leaves bipinnatisect or decompound; leaflets obliquely wedge-shaped and erose-toothed at the top, bases swollen at the point of attachment. Spathes 3-5, incomplete, tubular. Spadices from the axils of green leaves, shortly peduncled and with many pendulous, slender branches. Flowers monœcious, solitary and male or ternate with the central flower female. Male fl.: Sepals 3, imbricate in bud, coriaceous. Petals 3, connate at the base, larger than the sepals, valvate. Stamens numerous, connate at the base; anthers linear, basifixed. Pistillode O. Female fl. subglobose, smaller than the male. Sepals as in the male. Petals 3, short, rounded, valvate. Staminodes 3-6 or O. Ovary obovoid, trigonous, 3-celled; ovule solitary, erect in the fertile cells; stigma sessile, 3-lobed. Fruit globose, 1-2-seeded. Seeds smooth, plano-convex, dark-brown, shining; albumen horny, ruminate; embryo dorsal.

C. urens, Linn. Fl. Zeyl. 187; Fl. Br. I. 6, 422; Dalz. & Gibs. Bomb. Fl. 278; Brandis For. Fl. 550; Cooke Fl. Pres. Bomb. 2, 805; Gamble Ind. Timb. 729; Rheede Hort. Mal. t. 11. *The Mhár Palm* of Western India. *Hill Palm, Sago Palm* or *Fish-tail Palm. Birli,* M. *Baini,* K. *Shiwajata,* Guz.

Trunk annulate 40′-60′ high by 1′-1·5′ in diameter without root-suckers. Leaves 18′-20′ by 10′-15′; primary divisions 5′-6′ long, arched and drooping; leaflets fascicled or alternate, cuneate, obliquely truncate, 4″-8″ long, outer margin prolonged into a narrow triangular point, bright-green, glabrous, flabellately veined; petioles very stout, 3″ thick at the base; sheath smooth with fibrous, netted margins. Spadix 10′-12′ long, with many simple, drooping branches; peduncle stout, curved, completely covered with large, coriaceous spathes. Male fl. cylindric, ·5″ long. Sepals cordate, ciliate. Petals coriaceous, concave, reddish. Stamens about 40; anthers acuminate, as long as the petals. Female fl.: Sepals slightly broader than in the male. Staminodes usually 3. Fruit ·75″ in diameter, purple; pericarp full of red juice, very acrid, stinging, full of raphides; seeds 1-2.

Hotter parts of India from the Sikkim Himalaya up to 5000′ and Assam southwards to Ceylon, Western peninsula; common in rain-forest throughout the Konkan and N. Kanara. Fl. & Fr. throughout the year.

A very handsome palm with a smooth, grey, shining, annulate stem covered with long, shallow fissures with corky edges. Wood very hard, silicious outside, soft within, the outside brown with close, black, fibro-vascular bundles more or less angular in cross section with a large pore at the base inside. Weighs about 60 lbs. to the cub. ft. The wood is strong and durable and is used for building purposes, water-pipes, agricultural implements etc. The leaves and sheathing petioles yield an excellent black fibre (*Kittul fibre*) made into fishing lines, ropes, baskets, brushes etc. The trees are tapped for toddy which yields when boiled

coarse sugar (jaggery). The pith contains a palatable nutritious sago which is made into bread or boiled into gruel.

9. NANNORHOPS, H. WENDL.

A gregarious, tufted palm with prostrate, branching rhizomes or erect branching stems up to 20′ high. Leaves cuneately flabellate, rigid, plicate, split into bifid, curved segments; petioles short. Spadix in the axils of the green leaves, much-branched. Spathes tubular, sheathing. Flowers polygamous. Calyx membranous, tubular, 3-lobed. Corolla tripartite; segments valvate. Stamens in the hermaphrodite flowers 6, in the male about 9. Ovary trigonous; ovules basilar; styles short; stigmas 3-toothed. Fruit an ovoid or globose berry varying in diameter from ·25″-·75″. Seed free, erect; albumen horny, uniform, with a central cavity; embryo dorsal or subbasilar.

N. Ritchieana, H. Wendl. in Bot. Zeit. (1879) 148; Fl. Br. I. 6, 429; Cooke Fl. Pres. Bomb. 2, 808; *Chamærops Ritchieana,* Griff. in Calc. Jour. Nat. Hist. 5, 342; Brandis For. Fl. 547. *Pharra. Pfarra,* Sind.

Rhizomes underground up to 8′-10′ long by 3″-5″ thick usually much branched or stems erect up to 20′ high. Leaves 2′-3′ long and broad, greyish-green, consisting of 8-15 linear segments 12″-15″ long, often with interposed fibres, folded, bipartite; petioles unarmed, rusty-woolly at the base. Spadix pyramidal, erect, a much branched panicle, the branches in the axils of coriaceous sheaths narrowed into a lanceolate blade. Flowers male and bisexual in pairs in the axils of hyaline bracts which are distinct or connate and bicuspidate. Calyx thin, flat. Petals connate at the base. Stamens 6 (sometimes 9 in the flower); anthers sagittate. Ovary 3-celled, narrowed into a short style. Fruit globose, 1-seeded, ·5″-·75″ in diameter.

Western Punjab on the Salt range, Sind on dry arid hills. "Covers large areas near Harnai in Beluchistan rising to 5500′", Lace, Afghanistan. Fr. ripe H. S.

The leaves are made into baskets, fans, etc. and furnish a fibre suitable for ropes and cordage. The seeds are strung into rosaries and necklaces which are exported in quantities from Gwadur to Mecca. The leafbuds, young inflorescences, and fruit are eaten. The dried trunks and leaves are used for fuel and the scurf and wool of the petioles and leaves mixed with saltpetre make good tinder.

10. BORASSUS, LINN.

A lofty erect palm; stems often swollen about the middle and with dense masses of rootlets at the base. Leaves palmately fan-shaped; petioles spinously

serrate. Spadix very large, simply branched, sheathed with numerous, open, incomplete spathes. Flowers dicœcious; bracts large, sheathing, rigidly coriaceous. Male fl. small; spikes 1-3 at the ends of the branches, cylindric, densely clothed with imbricating bracts; numerous minute, unilateral spikelets concealed by these bracts so as to appear immersed in the spike, the flowers coming successively one by one to the surface as the spike lengthens. Stamens 6; filaments connate with the corolla into a stalk. Female fl. larger than the male, globose, on the spikes terminating the branches of the spadix. Sepals imbricate. Petals convolute. Staminodes 6-9. Ovary 3-4-celled. Fruit a sub-globose drupe 6"-8" in diameter seated on the large and partly fleshy perianth, with 1-3, obcordate, fibrous pyrenes. Seeds oblong, 3-lobed at the top; albumen horny, hollow.

B. flabellifer, Linn. Sp. Pl. 1187; Cooke Fl. Pres. Bomb. 2, 811; Fl. Br. I. 6. 482: Gamble Ind. Timb. 737; *flabelliformis,* Roxb. Fl. Ind. 3, 790; Brandis For. Fl. 544; Dalz. & Gibs. Bomb. Fl. 278. *The Palmyra Palm. Tad, tamar,* M. *Tali,* K. *Tad,* Guz.

Trunk up to 100′ by 2′ in diameter near the base, covered when young with dry bases of the petioles. Leaves 3′-5′ in diameter; segments 60-80, linear-lanceolate, 2′-4′ long, shining, folded along the midrib; margins spinulose; petioles 2′-4′ long, semiterete, edges with hard, horny, spinescent serratures; ligule short. Spadices 3′-4′ long. Male fl.: Sepals narrowly cuneate with truncate, inflexed tips. Petals shorter, obovate-spathulate. Anthers large, subsessile, oblong. Female fl. 1" in diameter. Sepals fleshy, reniform. Petals smaller. Ovary subtrigonous; stigmas sessile, recurved. Fruit with a fleshy and fibrous mesocarp; pyrenes 2·5" broad, black.

Planted and sometimes selfsown throughout the plains of India, Burmah and Ceylon, cultivated in large groves near the seacoast in the southern parts of the peninsula and in Ceylon, very common in the coast districts north of Ratnagiri but always cultivated, apparently wild in Tropical Africa. Fl. Mch.-Apl.

Stems rough, very black. Wood hard, heavy and durable, streaked outside, light-brown and soft inside, no hollow in the centre. Fibro-vascular bundles black, rounded, the horny part cordate in section with one large pore in the sinus. Weighs 65-70 lbs. to the cub. ft. Used for water-pipes and channels, posts, rafters, etc. The leaves are made into umbrellas, hats, fans, mats etc. and serve for thatching houses. The chief product of the tree is the sweet sap which flows from the cut spathes which is fermented and made into country liquor or boiled down into coarse sugar or jaggery. The *Palmyra-palm* is one of the most useful and valuable of Indian trees and every part of the plant is utilized. For an account of its multitudinous uses Watts Dictionary of Economic Plants may be consulted.

11. CORYPHA, LINN.

Tall stout unarmed palms with annulate stems, dying after flowering and fruiting. Leaves terminal, very large, orbicular, flabellately multifid, induplicate in vernation; petioles spinous. Spadix an immense, terminal, decompound panicle. Spathes many, tubular. Flowers bisexual, small and clustered. Calyx regular, trifid. Petals 3, connate below into a stipe; lobes imbricate or subvalvate in bud. Stamens 6, equal; anthers dorsifixed. Ovary 3-celled and lobed; ovules erect, anatropous; style short, subulate. Fruit of 1-3, fleshy, globose drupes. Seeds erect, globose; albumen horny; embryo spiral.

C. umbraculifera, Linn. Sp. Pl. ed. 2 (1753), 1187; Fl. Br. I. 6, 428; Dalz. & Gibs. Bomb. Fl. Suppl. 94; Brandis For. Fl. 549; Cooke Fl. Pres. Bomb. 2, 808; Gamble Ind. Timb. 732. *The Talipot Palm* of Ceylon and *Fan Palm* of Southern India. *Tali*, Vern. *Shri-tali*, K.

Trunk straight, cylindrical, 30′-80′ high by 2′-3′ in diameter. Leaves 8′-16′ in diameter, plicate, cleft to about the middle into 80-100 linear lobes up to 6″ broad, acute or bifid at the apex; petioles very stout, 5′-10′ long; margins armed with compressed, dark-coloured spines. Spadix pyramidal, 10′-20′ high and broad; sheathing bracts often pierced by the primary branches; branchlets forming pendulous spikes. Calyx broadly 3-toothed. Petals oblong, ·1′ long. Drupe globose, 1·5″ in diameter, shortly stipitate, olive-green, rather rough with 2 small abortive carpels at the base; seed globose, hard, smooth and polished.

Malabar coast and Ceylon; moist monsoon-forests of the Kumpta and Honavar talukas of N. Kanara, gregarious and covering extensive areas near Gairsoppah and Yena also on the Yellapore ghâts near rain-forest; planted in gardens near the seacoast. A monocarpic species flowering between the ages of 20-40 years. The horny, globose seeds *(bajurbet)* are made into rosaries, buttons and strung into necklaces all of which are exported to the Persian Gulf ports from N. Kanara. Segments of the leaves are used for writing on and files of old Kanarese records on this material are common in Hindu temples near the Kanara coast. The entire leaves as tatties serve to protect the walls of bungalows during the heavy South-West monsoon; they are also made into umbrellas in which there is a large trade along the Malabar and Kanara coasts. The stem contains abundance of brown flour or sago which is one of the staple foods of the Kunbis living near the sea-coast. According to the N. Kanara Working Plans of the Talipot Palm forests about 2000 mature trees are annually felled to supply the demand for this product. The wood is soft with a hard outer ring consisting of black vascular bundles those in the centre of the stem are soft and pale-coloured the horny part of the bundles is rounded and cordate in section with 1-3 large pores.

Order LXXXIX.—PANDANACEÆ.

Erect or scandent trees or shrubs; stems often forked and supported by thick aerial roots. Leaves simple, narrow, acuminate, in distichous spirals with a sheathing base, sessile, coriaceous, parallel-nerved; transverse veins prominent, often spinous-toothed on the margins and midrib. Flowers small, dicœcious, on axillary or terminal, simple or branched spadices, clothed with leafy bracts. Male fl.: Perianth O. Stamens numerous; filaments free or connate; anthers basifixed. Pistillode O. Female fl.: Perianth O. Staminodes small or O. Ovary free or connate with those of contiguous flowers in phalanges of two or more, 1-celled; ovule solitary and suberect or ovules numerous and parietal; style subsessile, papillose. Fruit a globose head of woody or fleshy, angular drupes each with a conical or convex apex crowned with the hardened stigma or style. Seeds minute; albumen hard and oily; embryo minute.

PANDANUS, LINN. F.

Palm-like trees or shrubs with simple or branched sometimes very short stems. Leaves spinous, elongate, spirally arranged at the ends of the branches, sheathing at the base. Male fl. in a compound spadix with numerous, yellow or white, keeled spathes. Stamens very numerous, single or united into bundles; filaments short or long; anthers elongate, 2-celled. Female fl.: Spadix simple; protected by leafy spathes. Staminodes O. Ovaries 1-celled, free or connate; ovule solitary in each cell, ascending from the base of the parietal placenta; style simple or forked. Drupes fibrous, woody, free or united in bundles. Seed large, strophiolate; albumen fleshy; embryo small; radicle inferior.

Carpels distinct. Style forked ... ... 1. P. furcatus.

Carpels connate in groups of 4-12. Styles not connate ... ... 2. P. tectorius.

P. furcatus, Roxb. Fl. Ind. 3, 744; Fl. Br. I. 6, 484; Dalz. & Gibs. Bomb. Fl. 279; Cooke Fl. Pres. Bomb. 2, 813; Gamble Ind. Timb. 740. *Ran-keura*, Vern.

A small gregarious tree with an erect, branched stem up to 40′ high with a diameter of 6,″ thick aerial roots from or near the base of the stem. Leaves dark-green, 8′-15′ by 3″-6″, with short, stout, erect spines on the margins and short, stout, retrorse spines on the midrib. Male fl. in compound, cylindrical

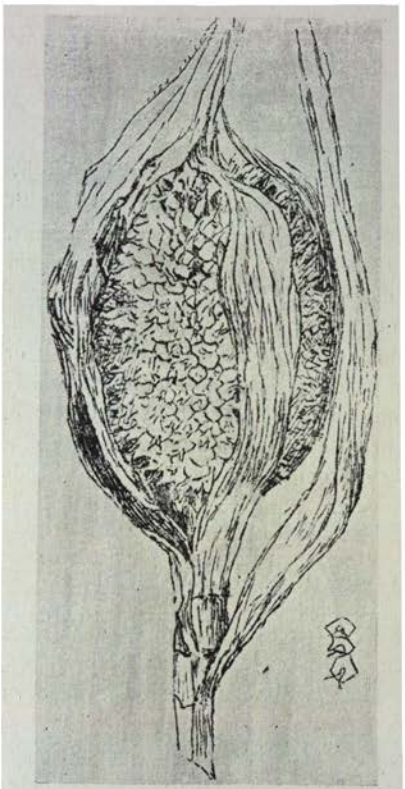

Fig 439. Pandanus furcatus, Roxb.

spikes, 4″-6″ long by ·75″-1·25″ broad. Spathes golden-yellow, inodorous, the lowest up to 2·5″ long by 4″ wide with a triquetrous, spinulose apex. Staminal-column ·2″ long with 3-5 anthers at the apex. Female fl.: Syncarpium usually solitary, subtrigonous, orange-yellow when ripe, 6″-9″ long; drupes obconic with a convex crown; style 2-3-forked, shining, spinulose.

Himalaya, Sikkim, Assam, Khasya, Burmah and the Malay peninsula, Western peninsula from Bombay southwards, common in the ghât forests of Belgaum and N. Kanara along streams and nallahs in marshy places. A low gregarious tree forming dense, impenetrable thickets. Fl. & Fr. C. & H. S. Trunk smooth, shining with a thin light-brown, shining bark-layer. Wood soft, outer layers moderately hard. Fibro-vascular bundles white, the horny parts rounded with 2-3 pores.

2. P. tectorius, Soland. ex Parkinson Jour. Voy. H. M. S. Endeavour 46; Cooke Fl. Pres. Bomb. 2, 814; Brandis Ind. Trees 659; *P. fascicularis,* Lam. Encycl. 372; Fl. Br. I. 6, 485; *P. odoratissimus,* Linn. f. Suppl. 424; Grah. Cat. Bomb. Pl. 227; Dalz. & Gibs. Bomb. Fl. 279; Gamble Ind. Timb. 740. *The Screw Pine. Keura,* Vern.

A gregarious much branched screw-pine with bent cylindrical stems up to 20′ high resting on strong aerial roots. Leaves glaucous-green, 3″-5″ by 1·5″-3″, ensiform, caudate-acuminate at the apex, sheathing at the base, coriaceous; marginal spines pointing forward, those of the midrib beneath pointing forward or backward. Male spadix with numerous, sessile, cylindrical spikes 2″-3″ long enclosed in long, very fragrant, caudate-acuminate, white spathes. Staminal-column ·25″-·5″ long; anthers cuspidate. Female spadix solitary, 2″ in diameter enclosed in yellow spathes like those of the male. Carpels connate in groups of 5-12, green; stigma short, reniform, yellow. Fruit an oblong or globose, orange or scarlet syncarpium 6″-10″ long; drupes 2″-3″ long, turbinate, angular,

consisting of the connate carpels; the apex of each carpel distinct, smooth with a lobulate stigma, or style.

Sandy seacoasts of Southern India, Burmah and the Andamans, common on the sea shore forming a belt of dense, impenetrable vegetation above high water mark, cultivated in gardens for its fragrant flowers and grown as a hedge plant along the coasts of the Konkan and N. Kanara. Fl. & Fr. H. & R. S.

Stems light-brown, smooth, shining. Wood very soft inside, moderately hard outside. Fibro-vascular bundles rounded, usually with 2 pores in each. The white, fragrant, keeled spathes are much used as an ornament for the hair by native women in Kanara and are also employed in coast temple ceremonies.

The gregarious dwarf soboliferous shrub with thin, densely matted stems found in rain-forest in very moist situations on the Siddapore ghâts of N. Kanara and mentioned in my Trees Bomb. 346 will perhaps, as suggested by Brandis Ind. Trees 659, be found identical with Hohenacker's No. 536 from Bantwala, South Kanara, (male only) and which seems to be the species described as *P. Thwaitesii* by Ugolino Martelli in Webbia 369. The male spadix is very flexuose, the spikes 2-3; anthers ·5″ long. I only found the N. Kanara plant in one locality on the Nilkund ghàt when it was not in flower.

The fibre from the leaves is used for nets, brushes etc. and the pulp of the fruit is sometimes eaten.

Order XC.—GRAMINEÆ.

Erect decumbent or creeping herbs (rarely suffruticose) of extremely gregarious habit, in the *Bambuseæ* shrubs or trees. Leaves simple, alternate, distichous, consisting of a tubular sheath split to the base with a narrow, linear blade rarely with a interposed petiole in the *Bambuseæ;* sheath terminating in a transverse, scarious or fringed, erect ligule. Inflorescence usually in terminal or lateral, variously arranged spikelets; flowers hermaphrodite or unisexual arranged in distichous, one or many-flowered spikelets usually with 1-2 empty, involucral-glumes (bracts) at the base. The flowering axis or rachilla bears one or more distichous glumes (floral-glumes), each of which has an axillary, transparent 2-nerved or keeled scale (palea). Each floral-glume embraces a palea with its incurved margins. Between the floral-glume and the palea is the flower consisting 2-3, small hyaline, fleshy scales (lodicules). Stamens hypogynous, usually 3, rarely 6, 4, 2 or 1, very rarely more; filaments slender, usually free; anthers versatile with 2 parallel cells, dehiscing by a longitudinal slit. Ovary entire, 1-celled; ovule erect, anatropous; styles 2, rarely 3 or 1, free or connate at the base usually elongate and exserted from the apex or sides of the spikelet, clothed with plumose, stigmatic hairs. Fruit a 1-seeded caryopsis; pericarp adherent to the testa and sometimes to the palea and floral-glume. Seed erect; albumen farinaceous; embryo minute at the base of and outside the albumen; cotyledon large shield-like (scutellum) dorsally adnate to the albumen; plumule and radicle small.

Stamens 6.
  Filaments free.
    Lodicules 2-3, membranous, ciliate ... ... 1. Bambusa.
    Lodicules O. ... ... 2. Dendrocalamus.
  Filaments connate in an elongated slender tube 3. Oxytenanthera.
Stamens numerous (6-120) ... . 4. Ochlandra.

1. BAMBUSA, SCHREB.

Large usually tufted bamboos with erect culms, rarely climbing, unarmed or with spinescent branchlets; sheaths broad, often with a short, triangular blade. Leaves linear or oblong-lanceolate; petioles short; leaf-sheaths auricled. Inflorescence in large, leafy or leafless branched panicles with clusters of one or more flowered spikelets along the branches. Lower-glumes 1-3, empty or bulbiferous;

flowering-glumes ovate-lanceolate, mucronate. Palea 2-keeled. Lodicules 2-3, membranous, usually ciliate. Stamens 6; filaments free; anthers narrow, obtuse, apiculate or penicillate. Ovary oblong, hairy at the apex; style short or long; stigmas 2-3. Caryopsis oblong, furrowed on one side; pericarp adherent to the seed; embryo large.

Stems spinous, not striped	1.	B. arundinacea.
Stems unarmed, striped green and yellow	2.	B. vulgaris.

1. B. arundinacea, Willd. Sp. Pl. 2, 245; Fl. Br. I. 7, 395; Grah. Cat. Bomb. Pl. 239; Dalz. & Gibs. Bomb. Fl. 299; Cooke Fl. Pres. Bomb. 2, 1046; Gamble Ind. Timb. 748. *The Spiny Bamboo* of Western India. *Kalak, padhai, mandgay,* Vern. *Dougi, bidungalu,* K.

Culms numerous, tufted, 50′-120′ high, bending at the tops; branches, numerous, distichous, alternating at even distances; internodes 12″-18″ long by 4″-6″ in diameter; walls 1″-2″ thick with a small cavity, nodes in the lower parts of the culm bearing half-whorls of nearly leafless, horizontal shoots armed with 2-3 recurved, stout, spines 1″-3″ long; lowest nodes rooting. Culm-sheaths coriaceous, orange-yellow when-young, hairy outside, shining and ribbed inside, often striped with green and even red, variable in shape and size up to 12″-15″ long by 9″-12″ broad, rounded at the apex; margins plated; blade triangular, shorter than the sheath, covered with brown, felted hairs inside, glabrous outside; ligule narrow, entire or fringed with whitish hairs. Leaves linear or linear-lanceolate, 7″-8″ by ·5″-·75″ with a stiff, sharp-pointed apex, rounded at the base, nearly glabrous above, glabrous or puberulous beneath; nerves 4-6, with 7-9 intermediate nervules and a few transverse, pellucid glands; leaf-sheath striate, glabrous or slightly pubescent, ending in a thick callus with a short bristly auricle; ligule short. Inflorescence an enormous panicle often formed by a whole culm; branchlets spikate, bearing loose clusters of about 5, pale, glabrous, lanceolate, acute spikelets ·5″-1″ long by ·2″ broad. Involucral glumes 1-2, ovate-lanceolate, ·2″-·3″ long, acute or mucronate, many-nerved, glabrous; flowering glumes 3-7, the lower with hermaphrodite flowers, the upper with male flowers only; palea 2-keeled, slightly longer, ciliate on the keels, subacute. Lodicules 3, small, hyaline, ovate or subovate, 1-3-nerved. Stamens exserted, drooping; filaments slender; anthers yellow, obtuse, sometimes with an apical bristle. Ovary oblong, hairy at the top; style short; stigmas 3, plumose. Caryopsis oblong, ·2″-·3″ long, grooved on one side, beaked, enclosed in the persistent glume and palea; embryo conspicuous.

Tropical India, Burmah and Ceylon, ascending to 3000′ and more in the Nilgiris and hills of Southern India, cultivated extensively in Northern India also in China; Western peninsula, throughout the Konkan and N. Kanara, gregarious along the banks of rivers and nallahs on alluvial soil in moist monsoon-forest,

absent from rain-forest, attains its maximum dimensions on the slopes of the Kalanuddi and other N. Kanara rivers where it is often associated with large *Teak, Jamba* and other trees; Khandesh Akrani, Guzerat-Dangs and generally throughout the Deccan districts. Flowers after long intervals probably every 60 years as stated by Rheede in the Hortus Malabaricus. A general flowering took place in N. Kanara during 1865 and there has been no other since. According to Beddome general flowerings are recorded in Malabar during 1804, 1836 and 1866 or at intervals of about 30 years. In his Monograph of the *Bambuseæ* of British India Gamble recognises two distinct varieties, the tall handsome, thick-culmed bamboo of N. Kanara and Southern India and the small-culmed dwarf, very thorny variety growing in Ganjam, Orissa and Burmah on laterite *(B. spinosa,* Roxb.). The culms are used for construction, mats, baskets and many other purposes. The largest and most handsome species in the Bombay forests, easily recognised by its thorny branchlets and large peculiar culm-sheaths.

2. B. vulgaris, Schrad. in Wendl. Collect. Pl. 2, 26; Fl. Br. I. 7, 391; Dalz. & Gibs. Bomb. Fl. 299; Gamble Bamb. Brit. Ind. 43; Cooke Fl. Pres. Bomb. 2, 1047; *The Yellow* and *Green Striped Bamboo. Udha-bans,* Vern.

Culms rather distant, 20′-30′ high by 2″-4″ in diameter, smooth, shining, green yellow or striped; internodes 10″-18″ long; culm-sheaths 6″-10″ long by 7″-9″ broad, rounded at the apex, retuse, thickly appressed-hairy, often striped like the stem; margins ciliate; blade subtriangular, 2″-6″ by 3″-4″, acute, appressed-hairy on both sides with a decurrent base ending in 2 rounded, falcate auricles with revolute, bristly fringed margins; ligule ·25″ broad, toothed or fimbriate. Leaves linear-lanceolate, 6″-10″ by ·5″-1·25″, slender, acute at the apex, rounded at the base; nerves 6-8 with 8-9 intermediate nervules connected by pellucid glands; leaf-sheaths striate, laxly hairy, with bristly auricles; ligule short, ciliolate. Panicle large, leafy, bearing numerous, slender branches with 3-10 bracteate clusters of short spikelets. Involucral-glumes 1-2, ovate, empty; floral-glumes 6-10, larger, with one imperfect flower above; palea faintly 3-veined. Lodicules 3, ciliate. Stamens exserted; anthers purple, apiculate, hairy at the tip. Stigmas 3 plumose. Caryopsis unknown.

Southern and Central Provinces of Ceylon up to 2000′, cultivated generally in the tropics; throughout the presidency in gardens. A very ornamental species.

2. DENDROCALAMUS, Nees.

Unarmed arborescent bamboos, with densely branching, underground rhizomes, in dense clumps of many culms; culm-sheath often very large. Leaves shortly petiolate; transverse veins visible on the under side if not obscured by hairs. Spikelets ovoid, 2-6-flowered, congested in globose clusters along the

branches of a compound panicle. Involucral-glumes 2-3, ovate acute, many-nerved; floral-glumes similar; palea of lower florets keeled, of the upper dorsally rounded. Lodicules 0. Stamens 6; filaments free. Ovary hairy; style long, filiform, undivided or bifid at the apex, base persistent. Seed enclosed in a hard, crustaceous pericarp, the position of the embryo not visible on the surface.

D. strictus, Nees in Linnæa 9, 476; Fl. Br. I. 7, 404; Bedd. Fl. Sylv, t. 325; Brandis For. Fl. 569; Gamble Bamb. Brit. Ind. 78, tt. 68, 69; Cooke Fl. Pres. Bomb. 2, 1050; *Bambusa stricta,* Roxb. Hort. Beng. 25; Dalz. & Gibs. Bomb. Fl. 299. *Male Bamboo. Shib, basa, bans, medar, mace, udha,* Vern.

A deciduous bamboo; culms middle-sized, the lower part with stiff, spreading, usually leafless branches one of which is larger than the others, upper part of culm slender, leafy; internodes 10″-15″ long by 2″-3″ in diameter, sometimes nearly solid in dry districts, in moist districts with a small hollow. Culm-sheaths shorter than the internodes, yellowish-brown, hairy or glabrous on the back, striate, rounded at the top, ciliate on the margins, slightly auricled at the base; blade triangular-subulate, more or less hairy, especially inside; ligule narrow. Leaves linear, 2″-10″ by ·25″-1·25″, densely pubescent on both sides with deciduous hairs. Inflorescence a large branching panicle of globose heads 1″ in diameter and ·5″-2″ apart. Spikelets hairy, ·25″-·5″ long, spinescent, the fertile mixed with the sterile. Involucral-glumes 2 or more, ovate, spinescent, many-nerved; floral-glumes ovate, sharply spinescent, hairy at the base; palea ovate, or obovate emarginate, lower 2-keeled, upper without keels, 6-8 nerved. Stamens long-exserted; anthers yellow. Ovary stipitate, turbinate; style long; stigma simple, plumose. Caryopsis ovoid, ·25″ long, shining, hairy at the apex, beaked with the persistent style-base.

The most common and widely spread bamboo in the dry regions of India and Burmah, Subhimalayan tract from the Indus eastwards up to 3000′, absent from Northern and Eastern Bengal, Assam and the North-West desert region; throughout the presidency, gregarious over large areas in the N. Kanara, Southern Mahratta, Deccan and Konkan districts. Flowers irregularly and sporadically in single clumps or parts of clumps or all the clumps over considerable areas flower simultaneously where the conditions of soil are identical. In the moister localities flowering is retarded and the culms remain green longer than in the drier. Straight solid culms are rare and usually there is a distinct cavity. The supply of solid male bamboos is in the Bombay presidency nearly altogether confined to the Deccan districts. A strong elastic bamboo used for building purposes, matting and basket-work, spear-handles, punting-poles, furniture etc. The demand for the male bamboo is very great and millions of culms are annually exploited from the Bombay forests. Hitherto there has been little or no restriction about cutting in N. Kanara where the supply is practically unlimited.

The seeded and dead clumps of this bamboo are often the source of extensive forest fires. The seed is eaten during times of scarcity.

3. OXYTENANTHERA, MUNRO.

Medium-sized erect or scandent, gregarious bamboos; culms sometimes isolated and tomentose; rhizomes thick, stoloniferous, creeping usually underground; stem-sheaths various with the imperfect blade narrow. Leaves short-petioled as in *Bambusa*. Inflorescence a large panicle of spikate heads of few or many spikelets. Spikelets often elongate and curved, few-flowered. Flowers 1-3, the terminal one or last but one fertile; rachilla obsolete. Involucral-glumes 1-3, empty; flowering-glumes many-nerved, spinose-mucronate. Palea in the fertile flowers convex, without keels, in the other flowers 2-keeled. Lodicules O. Stamens 6, monadedphous, exserted; filaments connate into a membranous, elongate tube; anthers with a mucro or bristly at the apex. Ovary ovoid; style slender; stigmas 2-3, 1″-3″ long, plumose. Caryopsis linear-oblong with a longitudinal furrow and beaked with the persistent base of the style.

Spikelets 2-flowered. Style hairy. Anthers acute not apiculate	1.	O. Stocksii.
Spikelets 1-flowered. Style glabrous. Anthers apiculate	2.	O. monostigma.

1. O. Stocksii, Munro in Trans. Linn. Soc. 26, 130; Fl. Br. I. 7, 403; Gamble Bamb. Brit. Ind. 75, t. 66; Bedd. Fl. Sylv. 233; Cooke Fl. Pres. Bomb. 2, 1049, *Konda, Oor-sheme*, K. *Chivari, mes,* Vern.

A medium-sized bamboo. Culms 30′ high by 1″-1·5″ in diameter, covered when young with dense white or grey, deciduous tomentum; internodes 6-″12″ long, the lowest 2-3 shortest with rings of aerial roots; culm-sheaths striate, silvery shining within, covered outside with matted, deciduous, reddish hairs mixed with small, white hairs with bulbous black bases; imperfect blade subulate-acuminate, rounded at the base and again expanded into a long, bearded auricle at the top of the sheath; ligule ·3″ long, fimbriate. Leaves linear-lanceolate, 4″-8″ by ·5″-·75″, with a long setaceous point at the apex rounded at the base, glabrous above, glabrous or pubescent beneath; margins scabrid, midrib narrow; nerves 5-6; leaf-sheaths striate, glabrous or at first pubescent; mouth produced; ligule long, dentate; petioles 1″ long. Panicle large, of spinous spikelets closely packed in globose heads about 1″ in diameter supported by rounded, chaffy bracts, the distance between the heads 1″-2″. Spikelets ·4″-·5″ long, narrow, glabrous, mucronate, many fertile mixed with a few sterile. Involucral-glumes 2, ovate, mucronate, 5-7-nerved, then 2 hermaphrodite flowers; flowering-glumes ovate, mucronate at the back. Palea of lower flower as long as the flowering-glume,

5-nerved between the 2 ciliate keels, obtuse, that of the upper flower concave, blunt, convulute. Stamens long-exserted; anthers short, acute. Ovary ovoid, hairy; style long with a purple plumose stigma.

Konkan and N. Kanara, commonly cultivated near coast villages, rare in the N. Kanara forests where it is I think doubtfully indigenous. Fl. Nov. Flowering culms are frequent. A stout, strong bamboo with a small hollow; used for construction, native umbrellas, baskets etc. makes excellent punting poles. A very useful species in the coast villages at a distance from the forests.

2. O. monostigma, Bedd. Fl. Sylv. 233; Fl. Br. I. 7, 402; Gamble Bamb. Brit. Ind. 74, t. 65; Cooke Fl. Pres. Bomb. 2, 1048; *Bambusa Ritcheyi,* Munro in Trans. Linn. Soc. 26, 113. *Choua, chiwa.* Vern.

Fig 540. Oxytenanthera monostigma, Bedd.

A medium-sized bamboo, culms 10″-30″ high covered with deciduous, brown tomentum, rather soft with a very small central cavity; internodes 15″-18″ long and 1″-1·5″ in diameter; culm-sheaths nearly as long as the internodes, thin at the edges, striate, sparsely covered with appressed white hairs, about 3″ wide at the base, gradually narrowed to the 2-lobed top; imperfect blade, linear-lanceolate,

about 3″ long; ligule long, fimbriate on the margin. Leaves very variable, linear-lanceolate, 6″-8″ by ·75″-1·5″, acuminate and ending in a setaceous point at the apex, unequally rounded at the base, nearly glabrous above, pale and sparsely hairy beneath; midrib yellow shining beneath with 7-12 main nerves; leaf-sheaths striate, mouth somewhat produced; ligule ·25″ long, acute or rounded. Inflorescence a large terminal panicle of usually more or less closely arranged heads of spinescent spikelets up to 2·5″ in diameter. Spikelets glabrous, ·75″-1″ long, 1-flowered, long-spinescent, very numerous, fertile and sterile about equal in number. Involucral-glumes 2-3, mucronate; flowering-glumes linear-lanceolate, long-mucronate, convolute. Palea shorter than the flowering-glume, concave, blunt, not keeled. Stamens exserted; tube short at first, afterwards long, cylindric; anthers long, bristly apiculate, the bristles sometimes hairy at the apex. Ovary ovate, acuminate; style long, glabrous, usually undivided; stigma plumose, curved and thickened in the old flowers. Caryopsis linear-oblong, grooved, mucronate with the persistent base of the style.

Western peninsula on the ghâts from Mahableshwar to the Anamalais; throughout the Konkan and N. Kanara usually in moist monsoon-forest. Clumps or single culms are frequently found in flower sometimes there is a general flowering over considerable areas like that of 1908 on the Mahableshwar plateau. The culms often grow separately and do not form closely packed clumps, like *Bambusa* or *Dendrocalamus*. The wood is somewhat soft and this species is very little used in N. Kanara where other excellent strong bamboos are available.

4. OCHLANDRA, THWAITES.

Unarmed gregarious slender hollow bamboos; culms erect, thin-walled, with long internodes; culm-sheaths thin, persistent with small auricles at the top. Leaves similar to those of *Bambusa*; margins cartilaginous; leaf-sheaths fringed; ligule short. Inflorescence of spikelets in heads forming interrupted spikes or arranged in large, terminal heads. Spikelets 1-flowered, often large, sterile and fertile. Involucral-glumes 2-5, usually mucronate; flowering glumes similar to the empty involucral-glumes. Palea thinly membranous, convolute, often emarginate, not keeled. Lodicules 2-12, conspicuous, variable, usually appressed to the filaments. Stamens 6-20, long-exserted; filaments free or connate; anthers linear, usually mucronate. Ovary narrow; style elongated; stigmas 4-8, linear, plumose, closely twisted before opening. Caryopsis large or very large, ovoid, long-beaked, more or less covered with the persistent glumes; pericarp thick fleshy, filled with starch.

O. Talboti, Brandis Ind. Trees 684; Cooke Fl. Pres. Bomb. 2, 1051; *O. Rheedii,* Var. *sivagiriana*, Gamble Bamb. Brit. Ind. 122, t. 108; Talb. Trees Bomb. 348. *Hooda,* Vern. *Wonte-nulge,* K.

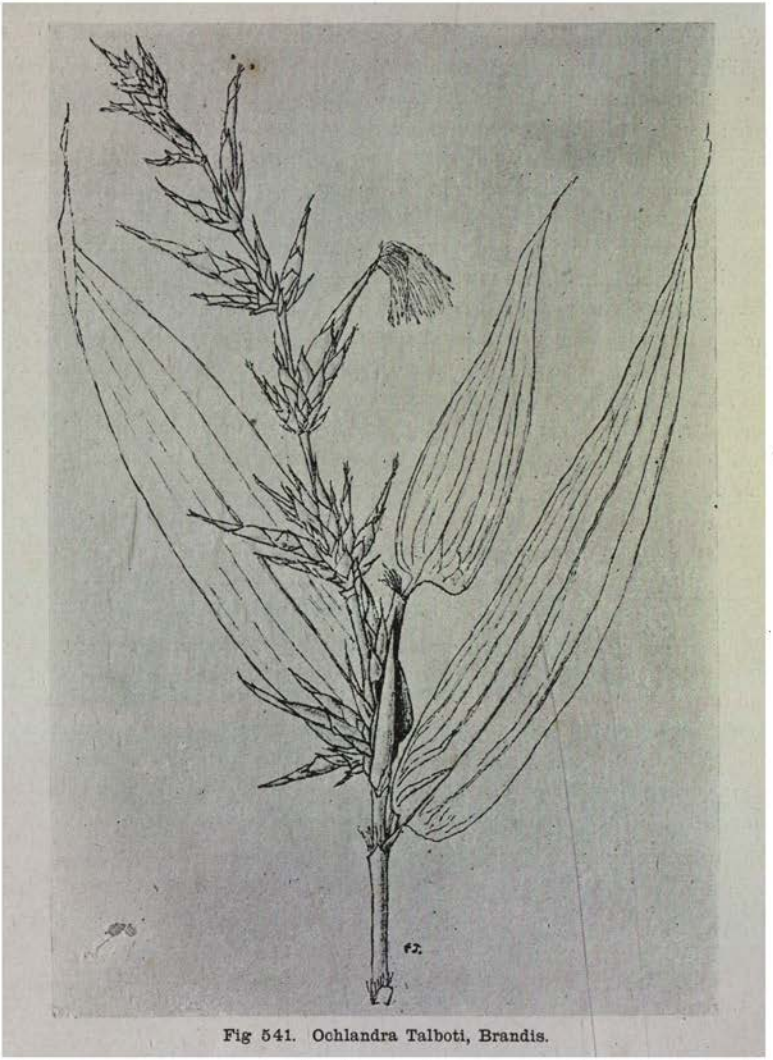

Fig 541. Ochlandra Talboti, Brandis.

Culms numerous, growing in dense clumps, 10′-20′ high by ·5″-·75″ in diameter, hollow, slender and drooping at the top, sometimes scandent; nodes thickened, glabrous, culm-sheaths smooth, striate, ciliate on the margins, rounded with 2 small ciliate auricles at the top; imperfect blade subulate-acuminate, hairy within at the base; ligula short, bearded. Leaves glabrous, broad lanceolate, 8″-12″ by 1·5″-2·5″, ending in a long setaceous point at the apex, cordate, round-

ed or subacute at the base, pale-green beneath, glabrous on both sides with scabrid margins; nerves about 10 on either side of the excentric midrib; nervules about 8 between each pair of nerves, distinct; petioles short, broad, channelled above; leaf-sheaths smooth, striate, nearly truncate at the top, bearded with long, thick, erect bristles; ligule very short. Spikelets 2-6, ·25″-1·25″ long in half whorls on a terminal, erect spike 4″-8″ long, whorls about 1″ apart at the base congested at the top of the spikes; fertile spikelets ovoid-cylindric, few, 1″-1·25″ long. Involucral-glumes 3-6, broadly ovate, acute, spinous-mucronate with spreading, white hairs at the top; flowering glumes larger, acute. Lodicules 6, linear, veined. Stamens 6-40, exserted and pendulous from the top of the spikelet; filaments free, long, slender; anthers linear, ·4″ long, sagittate at the base, thickened and emarginate at the top; staminodes 6, ·75″ long. Ovary prolonged into a slender style 1·5″ long; stigmas 5, papillose. Caryopsis ovoid, 2″-3″ long, by ·3″ in diameter at the base, glabrous shining, prolonged gradually into a long, slightly curved, striated beak, more or less completely enclosed in the 4, persistent glumes.

N. Kanara in monsoon and rain-forest often along the banks of rivers and nallahs on the Southern ghâts, very common near Dodmune and Nilkund and generally throughout the Coompta and Honawar talukas. Flowered over considerable areas during 1896-97 and as far as I could ascertain had never before been seen in flower. A graceful reed-like bamboo growing in dense clumps of many culms; culms very slender at the tips which bend over like carriage whips. I found this species common on the Gairsoppah ghât near rain-forest with some of the culms scandent and 40′-50′ long. Leaf specimens of a bamboo with a very similar habit from the above locality were referred to Mr. Gamble who thought that they might possibly belong to *Teinostachyum Wightii,* Beddome. The evidence is however I think scarcely sufficient to warrant the inclusion of this latter species in the Bombay Flora.

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on 19 February, 2019